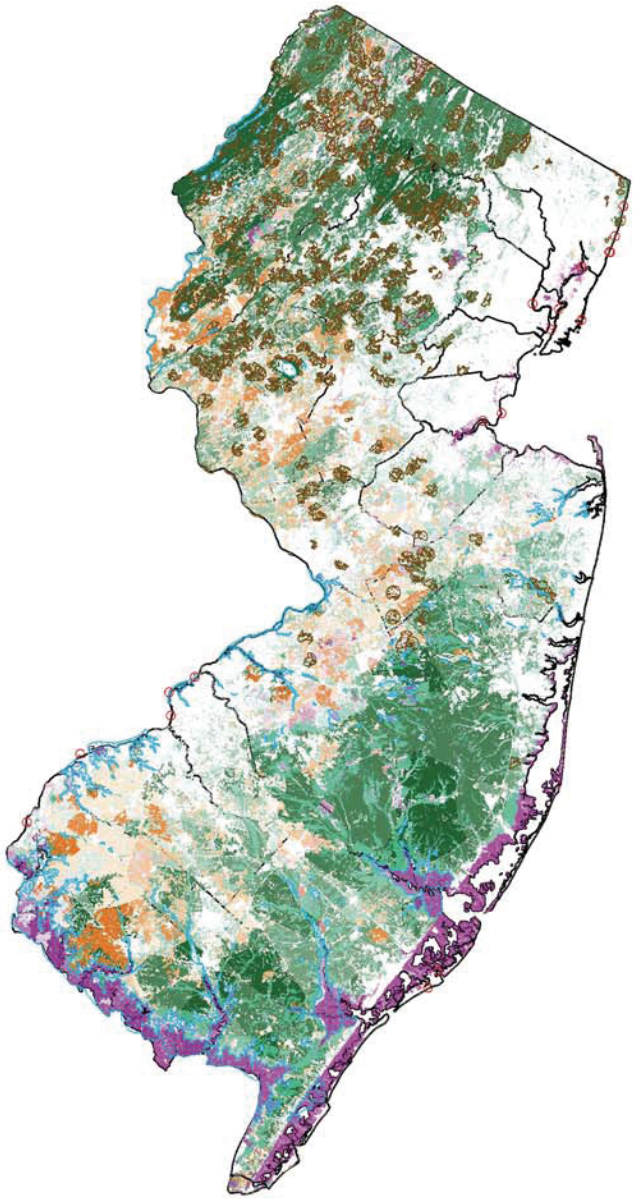
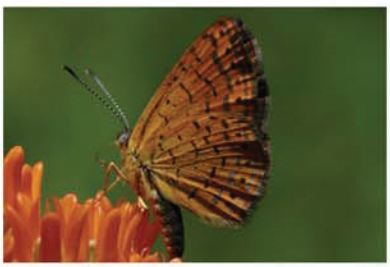
NEW JERSEY WILDLIFE ACTION PLAN

JANUARY 23, 2008





New Jersey Department of Environmental Protection
Division of Fish & Wildlife, Endangered & Nongame Species Program
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New Jersey Wildlife Action Plan
for Wildlife of Greatest Conservation Need

Prepared by the
NJ Department of Environmental Protection
Division of Fish and Wildlife
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Acknowledgments

The NJ Wildlife Action Plan (Plan) is a blueprint for the future conservation of our state's species of greatest conservation need. The Plan was developed through multiple stages, but began with the assistance of a contract planner, Gideon Lachman. We thank Gideon for helping us get the ball rolling and acknowledge the staff of the Endangered and Nongame Species Program (ENSP) within the Department of the Environmental Protection's Division of Fish and Wildlife and the scientific and technical staff of the Conserve Wildlife Foundation (CWF) whose dedicated work over many months shaped the Plan. ENSP and CWF staff include David Jenkins, Acting Chief, Kris Schantz, Kathy Clark, Michael Valent, Amanda Dey, David Golden, Jeanette Bowers-Altman, Naomi Avissar, Melissa Craddock, Michael Davenport, Gretchen Fowles, MacKenzie Hall, Brian Henderson, Chris Kisiel, Kim Korth, Sharon (DeFalco) Petzinger, Todd Pover, Larissa Smith, Peter Winkler, Patrick Woerner, Brian Zarate, Theresa Terry, and Linda Watson. Numerous programs and staff from the Department of Environmental Protection and the various Bureaus within the Division of Fish and Wildlife provided valuable review and input. Special thanks to Director, David Chanda and James Sciascia, Chief of the Bureau of Information and Education, for their continued support and assistance during the development and review of the Plan. We also appreciate significant input from Deputy Commissioner John Watson, as well as the Director of the Division of Policy and Planning, Jeanne Herb, and Marjorie Kaplan; and for continued support from Commissioner Lisa Jackson and Assistant Commissioner Amy Cradic as we begin implementing the Plan statewide.

A special debt of gratitude is owed to the New Jersey Endangered and Nongame Species Advisory Committee, chaired by Jane Morton Galetto. Their expertise and guidance over the years and during the development of the Plan have helped New Jersey become a national leader in rare species conservation. The NJ Fish and Game Council also provided input.

We are also grateful to the Conserve Wildlife Foundation of New Jersey for their support of this project and thank Executive Director Margaret O'Gorman and staff, Patricia Shapella, Pola Galie, and Maria Dubois-Grace for assistance in reviewing, editing, and pursuing implementation of the Plan. Special thanks to Kevin Frey for his assistance in reviewing and editing the state-level brochure associated with the Plan. Other agencies and New Jersey conservation organizations that were major contributors to the Plan through the development and the review process that deserve special recognition include NJ Audubon Society, NJ Conservation Foundation, The Nature Conservancy-NJ Chapter, NJ Future, the Pinelands Commission, D&R Greenway Land Trust, the US Fish and Wildlife Service-NJ Field Office, National Wildlife Refuges (NWR), especially the Edwin B. Forsythe NWR, Cape May NWR, Supawna Meadows NWR, Great Swamp NWR, Wallkill River NWR, the National Park Service (Gateway National Recreation Area–Sandy Hook Unit and Delaware Water Gap National Recreation Area–Millbrook), US Department of Defense, and USDA Natural Resource Conservation Service (NRCS).

A special thank you to the Environmental Law Institute and NJ Future for helping us organize the Wildlife Summit and to the representatives of over 60 federal, state, county, and private agencies and organizations who attended and participated to foster discussion and provide recommendations regarding New Jersey wildlife conservation issues. Duke Farms Foundation

and the Doris Duke Charitable Foundation graciously hosted and sponsored the Wildlife Summit and we appreciate their support on the Plan and other conservation initiatives.

We would also like to thank Martin J. McHugh, former Director of the Division of Fish and Wildlife, and Linda Tesauro, former Executive Director and founder of the Conserve Wildlife Foundation, for their support and assistance during the development of the Plan. We would especially like to thank Larry Niles, Ph.D., former Bureau Chief of the Endangered and Nongame Species Program, for his tireless efforts, innovative thinking, and endless support during the development and planning phase for implementation of the Wildlife Action Plan.

The inherent danger in writing an acknowledgment is not mentioning all the individuals and organizations that contributed. This is especially true for the New Jersey Wildlife Action Plan since so many people and organizations played key roles in its development. We encourage readers to carefully review Appendix V within the Plan that we hope includes all who participated in the development of the Wildlife Action Plan.

I. Preface

A. A letter from Deputy Commissioner Jay S. Watson

New Jersey is fortunate to have a rich diversity of fish and wildlife. Over 900 vertebrate species and innumerable invertebrates populate the state and its coast. However, as the most densely populated state in the nation, New Jersey also faces many challenges ensuring the continued health of our fish and wildlife population. The New Jersey Wildlife Action Plan was created to meet these challenges. The main goal of the planning effort was to outline action we can take to prevent wildlife from becoming so rare that it is expensive or impossible to save them.

The Wildlife Action Plan was developed by a diverse coalition of scientists, ecologists, conservationists, sportsmen, and farmers, with input from the public. It calls on government and non-government agencies, landowners and land stewards, and private citizens to join together in a cooperative effort to preserve the state's diversity of wildlife and the habitat upon which it depends.

While we cannot fully predict the impact of losing any species, we do know that all species play a role in maintaining ecological balance and integrity. By protecting species and their habitat, we also secure the health and quality of life for New Jersey residents by improving water quality; protecting water supply, riparian areas and floodplains; and preserving forests and the natural cooling they provide.

The Department of Environmental Protection's Division of Fish and Wildlife takes great pride in the stewardship of species that are endangered, threatened, rare or have special conservation needs. New Jersey has a history of success bringing wild turkey, white-tailed deer and numerous fish species back from the brink of extinction and has made great strides in the recovery of rare species populations such as the bald eagle, osprey, peregrine falcon, and bobcat. This plan is the state's blueprint for continued success.

On behalf of its employees, I wish to extend our thanks to all the stakeholders that contributed to this Wildlife Action Plan and we look forward to our future work with our partners in conservation on behalf of New Jersey's wildlife.

John S. Watson, Jr.,
Deputy Commissioner for Natural Resources
New Jersey Department of Environmental Protection

B. A letter from Acting Director David Chanda

The New Jersey Department of Environmental Protection's Division of Fish and Wildlife (Division) is responsible for providing a secure and healthy environment for the State's wildlife resources. Managing all of the state's wildlife resources is a task requiring professional and scientific expertise, as well as public support.

Twenty-five years ago when I began my career in wildlife management there was only one nesting pair of bald eagles left in the entire state, peregrine falcons had not successfully nested for many years and the osprey was an endangered species. Today, thanks to the hard work and efforts of a dedicated staff of professionals in the Division's Endangered Species Program (along with the help and support of countless volunteers and conservation groups), there are more than 55 active bald eagle nests. In addition, 18 - 20 pairs of peregrine falcons regularly nest in the Garden State, and the restoration efforts for osprey were so successful that it has the distinction of being the first species in the history of New Jersey to be upgraded from the State's endangered species list to the threatened list.

These success stories are merely a precursor to what can be accomplished as we begin to implement New Jersey's "Wildlife Action Plan." This action plan was created in a collaborative effort that included biologists, conservationists, landowners, sportsmen and women, and the general public. This proactive plan will help conserve wildlife species and vital habitats before they become too rare and costly to protect. As our communities grow, the Wildlife Action Plan will give us the ability to fulfill our responsibility to conserve wildlife and the lands and waters on which wildlife depends so that future generations can also enjoy the rich diversity of wildlife that inhabits the Garden State.

The Division is committed to working for both the wildlife and the citizens of our state to ensure stable and thriving conditions where both can exist in balance with one another. Healthy wildlife populations, habitat and sound wildlife management doesn't just happen. It is the result of a collaborative effort with conservation organizations and professional management provided by the Division. New Jersey's "Wildlife Action Plan" provides a blueprint for future conservation efforts and provides a powerful new tool for wildlife conservation.

I hope that you will join me as we continue to conserve the State's fish and wildlife resources.

David Chanda
Acting Director
NJ Division of Fish and Wildlife

II. Executive Summary

Since early 2004, the NJ Division of Fish and Wildlife staff has been working on a blueprint for the future conservation of our state's wildlife species of greatest conservation need. This blueprint is called the *Wildlife Action Plan* (WAP) and was formerly referred to as the *Comprehensive Wildlife Conservation Strategy* (CWCS).

Each state must submit a Wildlife Action Plan (WAP) to the US Fish and Wildlife Service (USFWS) by October 2005 for review and approval in order to qualify for future federal funds through the State Wildlife Grants program. The New Jersey WAP must be considered a living document to remain relevant and current. Consequently, although we are submitting the required Draft version to the USFWS by October 1 we plan to continue accepting public comments during the review period and taking those comments into consideration in developing the final version of the Plan.

The State Wildlife Grants program provides federal funds to states for the conservation of species that are endangered, threatened, rare or have special conservation needs. New Jersey currently receives approximately $1.2 million dollars of State Wildlife Grants funding each year. Citizen contributions to the Division's Endangered and Nongame Species Program provide the 25% match that enables us to obtain these critical federal funds. Essentially, every dollar donated through the Check-off For Wildlife or through the purchase of Conserve Wildlife license plates leverages three federal dollars in State Wildlife Grants funding.

The New Jersey Wildlife Action Plan lays the foundation for better coordination of wildlife research and management between the programs within the Division of Fish and Wildlife, state and federal agencies, and the many partners in the conservation community (Appendix V). In addition, the conservation strategies developed by each state will collectively offer a strong argument to Congress to provide a stable and permanent funding source for the conservation of rare wildlife.

The New Jersey WAP addresses conservation efforts at scales that range from statewide, to Landscape Regions, to more localized Conservation Zones within each Landscape Region. Citizens interested in a particular region of the state need only to review the Overview (State information), the Regional information, and the Conservation Zone of interest to understand their role in wildlife conservation and how it relates to statewide efforts.

Following Congressional requirements, the WAP focuses on wildlife Species of Greatest Conservation Need (SGCN). These include species with state or federal status and those whose populations are declining and may become threatened or endangered in the future. Congress further required that each WAP address the following eight elements:

1. Identify the distribution and abundance of species of greatest conservation need (SGCN).
2. Describe the location and condition of key habitats essential to the SGCN.
3. Describe the threats to and research needs for SGCN and their habitats.

4. Describe the conservation actions required to conserve the identified species and their habitats.
5. Identify monitoring plans for SGCN, their habitats, and the proposed conservation actions.
6. Describe the review process of the WAP at intervals not to exceed ten years.
7. Coordinate the WAP with other federal, state, and local agencies' wildlife and land management plans.
8. Include a public involvement process in the development and implementation of the WAP.

For additional information regarding the eight elements, please review the *NAAT Evaluation Guide to NJ's Wildlife Action Plan (WAP)* section of the Plan or visit the Teaming with Wildlife website at: http://www.teaming.com/state_wildlife_strategies.htm

The greatest threats to NJ's natural resources include habitat loss, destruction, alteration, and fragmentation. This has been a recurring theme within NJ for years as it is the most densely populated state in our nation with an annually increasing population requiring additional homes, roads, commercial buildings, schools, etc. Additional threats include, but are not limited to, invasive species (flora and fauna, aquatic and terrestrial), pollution, and unsustainable land management practices.

The NJ WAP provides a common comprehensive conservation vision with guidance and specific actions for both long- and short-term management efforts that can be implemented by government and non-government agencies, conservation organizations, land stewards, and private landowners. The WAP will guide partners in conservation in a cooperative effort to minimize the threats and improve habitat quality for NJ's wildlife SGCN.

Recommended conservation actions include:

1. Full recovery of rare species populations through habitat restoration, land acquisition, and landowner incentives.
2. Public education and outreach programs regarding wildlife, critical habitats, and the deleterious effects of invasive species and other threats.
3. Development of effective conservation partnerships among organizations representing diverse interests in wildlife conservation.
4. Continued research and monitoring of SGCN to inform biological databases and NJ's Landscape critical habitat mapping, and direct local and statewide conservation efforts.

The WAP provides a variety of conservation actions at various stages focusing on the conservation of our SGCN and their habitats. The NJ Division of Fish and Wildlife recognizes the daunting task of implementing the WAP. There is truly much work to be done and much to be gained from a statewide effort with a unified vision.

Historically, NJ's financial resources for conservation have been limited. However, in recent years the State Wildlife Grants funding has been a tremendous boon to the NJ Division of Fish and Wildlife, especially to the Endangered and Nongame Species Program. Traditionally, hunting, fishing, and trapping licenses have accounted for nearly 100% of NJ's wildlife conservation funds focused on game and fish species. However, the annually decreasing number of sportsmen within the state has led to a diminished source of financial resources needed to manage such species. In addition, the Endangered and Nongame Species Program, responsible for over 400 nongame and rare species, has relied on private grants, tax checkoff, the Conserve Wildlife license plate, and private donations to support on-going research focused on SGCN.

The State Wildlife Grants program will replenish and provide a source of funding for conservation efforts throughout the state as we begin implementation of the WAP. While the WAP outlines somewhat lofty but much needed goals, we are confident that local, state, and federal governments, conservation organizations, and NJ's citizens will successfully partner and work toward improving NJ's natural communities and conservation of our Species of Greatest Conservation Need.

III. Outline of Contents Page

VII. Appendices (continued)

VIII. Attachments

K. Priority Conservation Goals and Actions: Piedmont Plains Regional Landscape
(Pamphlet to be inserted during summer - fall 2007)

L. Priority Conservation Goals and Actions: Skylands Regional Landscape
(Pamphlet to be inserted during summer - fall 2007)

M. Priority Conservation Goals and Actions: Atlantic Coastal Regional Landscape
(Pamphlet to be inserted during summer - fall 2007)

N. Priority Conservation Goals and Actions: Pinelands Regional Landscape
(Pamphlet to be inserted during summer - fall 2007)

O. Priority Conservation Goals and Actions: Delaware Bay Regional Landscape
(Pamphlet to be inserted during summer - fall 2007)

IV . NAAT Evaluation Guide to NJ's Wildlife Action Plan

This guide is provided for the National Advisory Acceptance Team (NAAT) for the purpose of evaluating NJ's Wildlife Action Plan (WAP or Plan) in addressing the 8 required elements.

The New Jersey Plan is organized by five geographic regions with subregions identified within each major region. For ease of review, the Plan's structure is identical for each of the five major regions in describing the region, subregions, its habitats, species of conservation need, threats, conservation goals and actions and partnerships.

Following Congressional requirements, the WAP focuses on wildlife Species of Greatest Conservation Need (SGCN). These include species with state or federal status and those whose populations are declining and may become threatened or endangered in the future. Congress further required that each WAP include the following eight elements:

1. Identify the distribution and abundance of species of greatest conservation need (SGCN)

The process of determining the SGCN is described in the *Overview* (pages 3 - 5). We considered four existing data sources – the Landscape Project of Critical Habitat, the Delphi Species Status Assessment, the State Wildlife Grants Work Plan, and the Endangered and Nongame Species Advisory Committee – as a basis for identifying species and their distribution in the state.

a. The Wildlife Action Plan addresses New Jersey's non-harvested endangered, threatened and special concern species, as well as species of regional priority with or without seasonal harvests. The Division of Fish and Wildlife is currently working on a critical habitat map and a comprehensive plan for all game species. Plans for cold-water and warm-water game fishes already exist.

b. All species that occur within each Landscape Region and Conservation Zone are presented in tables within the *Wildlife of Greatest Conservation Need* sections of each Region and Zone. Federally-listed species are identified in separate tables, and while federal threatened or endangered status automatically confers state endangered status, we did not repeat those species in the state-endangered tables. From these lists we have identified critical habitat types within Zones and have proposed and prioritized actions to protect them.

c. Species and species suites that are present statewide are addressed within the statewide-level goals as well as more specifically within the region and zone goals and actions.

2. *Describe the location and condition of key habitats essential to the SGCN.*

a. All important habitat locations were based on the following databases: Biotics; Landscape Map; NJ Audubon Society's Breeding Bird Atlas; the Endangered and Nongame Species Program's Herptile Atlas and Neotropical Landbird Surveys;

the Division of Fish and Wildlife, Bureau of Wildlife Management's waterfowl and upland game bird surveys; and the Department of Environmental Protection, Office of Land Management, Natural Heritage Program and NatureServe Conservation Status Assessment.

b. Habitat descriptions are provided within the state, regional, and conservation zone sections. Within the *Overview, Section C (New Jersey's Landscape Regions and Conservation Zone)*, the WAP describes the general habitat types found within each Landscape Region and their value to wildlife. Within the Regional sections, the *Habitats* portion identifies and prioritizes habitat types within the region and describes their general condition. Each Zone's *Habitats* portion provides further details regarding the condition of unique habitats found within each Zone.

c. The Plan was constructed for the benefit of users. It is linked to the viewable, interactive mapping (the Landscape Map) by the attribute table so users can read the appropriate section of the Wildlife Action Plan (WAP) for a specific map area. The WAP's sections suggest conservation actions for that area. It will also be available in its entirety on the Department of Environmental Protection, Division of Fish and Wildlife's website, www.njfishandwildlife.com.

3. *Describe the threats to and research needs for SGCN and their habitats.*

a. The WAP addresses national, interstate, and statewide threats within the *Overview, Section E (Threats to Wildlife and Habitats)*. In addition, specific threats to the habitats and wildlife of the regions and conservation zones are included within each Region's *Threats* section and each Zone's *Threats to Wildlife and Habitats* section. The listed threats have been compiled from the state's long- and short-term research and conservation partners.

4. Describe the conservation actions required to conserve the identified species and their habitats.

a. The Plan provides conservation actions at all scales from state, to Landscape Region, to the more localized Conservation Zone. At the state level, the Plan identifies goals and prescribes strategies that apply to all areas (*Overview – Section F)*. At the Landscape level we propose actions that apply in each distinct Landscape Region, while goals and conservation actions required to achieve those goals are prescribed at the Conservation Zone level (found within the *Conservation goals and Conservation actions* sections of each Zone, respectively).

b. This Plan is constructed to provide a framework for the recovery of endangered, threatened and rare wildlife species, and to maintain the integrity of ecological communities. Targets for each species were chosen at the Region and Zone levels and include maintaining, increasing or restoring/researching populations within a

Region or Zone, This information is presented in tables within the *Wildlife of Greatest Conservation Need* sections of each Region.

5. Identify monitoring plans for SGCN, their habitats, and the proposed conservation actions.

a. Proposed monitoring efforts for SGCN, their habitats, and the implementation of the conservation actions have been provided within the *Monitoring Success* portions of the *Overview, Section F (State-level Objectives)* and within each Zone.

b. Monitoring efforts include both long- and short-term surveys. The results will allow necessary adjustments to be made prior to the scheduled WAP review.

6. Describe the review process of the WAP at intervals not to exceed ten years.

a. The WAP is an on-going, dynamic document, to be reviewed every five years. Details regarding the review process can be found within the *Overview, Section F, Part 8 (State-level Objectives - Review of Wildlife Action Plan).*

7. Coordinate the WAP with other federal, state, and local agencies' wildlife and land management plans

a. The Plan incorporates the priorities of all national plans including: Partners in Flight North American Landbird Conservation Plan (Mid-Atlantic, Piedmont, and Southern New England regions) The U.S. Shorebird Conservation Plan; Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan (Mid-Atlantic/New England Maritime); North American Waterfowl Management Plan; Northeast American Woodcock Management Plan; U.S. Fish and Wildlife list of species of conservation concern (2002); Partners in Amphibian and Reptile Conservation; and U.S. Fish and Wildlife Service Indiana Bat (*Myotis sodalis*) Revised Recovery Plan. In addition, nongame species not well-represented among national or regional plans, nor through New Jersey's Delphi Status Review that are identified with state element ranks S1-S3 and/ or global element ranks G1-G3 through NatureServe Conservation Status Assessment (Appendix I) have been incorporated.

b. The WAP will be used as a basis for the development of new, and revisions to existing, site-management plans such as those used by National Wildlife Refuges, state and federal parks and forests, land stewards, etc. The WAP will also be reviewed and revised as necessary (see element #6 above), however, it will remain a critical goal that all plans for the management of critical habitats and wildlife maintain the statewide vision and rely upon cooperative partnerships between agencies and land stewards.

8. Include a public involvement process in the development and implementation of the WAP.

a. The Division of Fish and Wildlife's process for the development of the Plan is found in the *Overview, Section A (The Unprecedented Challenge Facing Wildlife Conservation in New Jersey) and Section F, Part 8 (State-level Objectives - Review of Comprehensive Wildlife Conservation Strategy).*

b. Opportunities for public participation to implement the conservation actions can be found within the section entitled *Potential Partnerships to Deliver Conservation* that is part of Section F of the *Overview (State-level Objectives section)* and, also, within each Conservation Zone.

c. It will be necessary for the staff of DEP's Division of Fish and Wildlife to work toward integrating conservation actions recommended in the WAP into site-specific management plans. This may involve more interests than those covered in the WAP. However, when used in conjunction with the Landscape Map and the *Endangered and Threatened Wildlife of New Jersey* book, the WAP makes a clear statement of the needs for these species, thus providing a useful proactive measure to help reduce user conflicts with regards to rare wildlife.

V. Overview

A. The Unprecedented Challenge Facing Wildlife Conservation in New Jersey

The rapidly changing landscape of New Jersey creates an unprecedented wildlife conservation challenge for its citizens. Destructive influences on habitat and wildlife populations abound in our state. Some of these influences result from the combined negative pressures of those normally associated with urban states, such as unsustainable development and the inevitable damaging impacts to all wildlife from habitat destruction. Other influences more associated with rural states, include human competition with wildlife for natural resources, declining forest health and the influx of exotic or invasive species.

Since New Jersey has extremely diverse and ecologically significant natural communities, the combined negative impacts of these influences are enhanced. Our larger, unfragmented forest tracts are among the largest on the mid-Atlantic coast and are home to resident bobcats, barred owls, and timber rattlesnakes and provide essential stopover habitat for most of the eastern U.S. migratory population of songbirds and raptors. Similarly, New Jersey's Atlantic and Delaware Bay coastal habitats are home to bald eagles, northern harriers, black rails, and piping plovers and are critical to millions of migratory raptors, waterfowl, shorebirds, butterflies, dragonflies, and fishes. Our woods, wetlands, streams, and fields support a staggering array of wildlife species, including 73 state endangered and threatened species, some of which are recognized as globally rare.

Extraordinary threats in an extraordinary natural landscape present a great challenge to New Jersey residents. Undaunted, our citizens have overwhelmingly supported important initiatives to protect our wildlife and habitat. New Jersey is the first state where every county has a voter-approved land acquisition program. The state itself spends millions of dollars for important land acquisition, more than any other state in our region. New Jersey's public land system is impressive. In fact, we have more land in public ownership than most states, including many that are much larger than New Jersey. In addition, the NJ Department of Environmental Protection's Land Use Regulation Program annually protects thousands of acres from unwise development because we have one of the few statewide programs that protects wetlands, vernal pools, and important coastal habitats.

These significant tools exist to protect and manage all wildlife. However, if we ask whether all of our wildlife species are secure and if they all will be available to our children or to their children, the answer is not likely. The number of species identified as being threatened with extinction in New Jersey grows every year; 14 new species have been listed since 2001. Although we are rapidly buying land to protect throughout New Jersey, these acquisitions do not come close to equaling the amount of land being lost to development. In fact, each year New Jersey loses nearly 4,000 hectares of farmland alone to development. Clearly we need new tools and new methods to address this challenge.

The New Jersey Wildlife Action Plan for Species of Greatest Conservation Need (Plan) is just such a tool. Originally created to meet the eligibility requirement for US Fish and Wildlife Service State Wildlife Grants, New Jersey's Plan has evolved into something much more important. Under the leadership of the Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP) and with the help of staff of the other Division Bureaus, partner conservation agencies and stakeholder groups, this document is a blueprint for statewide protection of wildlife with special conservation needs. The Plan embodies the collective judgment of the state's conservation professionals regarding which species should receive special attention and what should be done. It identifies tasks for nearly every agency and group that has some influence over land and wildlife. We intend to use the Plan to create a more robust system of rare wildlife and habitat protection that utilizes all appropriate agencies and groups. The Plan is a dynamic tool for landowners of all types, from backyard owners to land stewards of large public forests, to use for the protection of habitat and species of greatest conservation need.

Managing For Biodiversity:
One major premise and seven focus areas underlie the Plan. The major premise is that certain species require new or additional protection and management. The seven focus areas are:

1. Habitat Destruction
Habitat destruction is the greatest threat to New Jersey wildlife. It is the equivalent of actually "taking" or killing wildlife, since an organism denied its ability to feed and/or reproduce can no longer exist. New Jersey is moving to adopt endangered and threatened species rules to further protect endangered and threatened wildlife and their associated habitat. Identification, protection, and, where possible, acquisition of critical habitats for such wildlife are key components of the Plan. Another goal is to further integrate water quality regulations and aquatic habitat delineation into endangered and threatened wildlife protection.

2. Stewardship and Restoration
Managing lands for biodiversity is another key thrust of the Plan. To this purpose, the Plan recognizes the need for dedicated funding for biodiversity land management on both public and private lands. NJ has recently initiated coordinated biodiversity protection on DEP lands. Applying *best management practices* focused on endangered, threatened, and rare species and maintenance or improvement of the ecological integrity of New Jersey's natural communities will be the standard operating procedure on all public lands. Conservation actions throughout the document that address this issue include, but are not limited to, the development of *best management practices*, maintaining and enhancing recognized tracts of critical habitats for suites of wildlife species, and the maintenance and restoration of riparian buffers.

3. Wildlife Management
Control of overabundant species in identified areas, such as white-tailed deer, is an essential component of the Plan. It calls for a statewide, multi-organization effort to increase public education and awareness of the benefits that hunting of certain species has for all wildlife and natural communities. The Plan calls for the development of area-specific deer densities with goals focused on forest health and ecological integrity, innovative methods to increase land accessibility to hunters, and long-term monitoring of habitat health.

4. Government-Wide Invasive Species Policy
Invasive species, both plant and animal, greatly threaten natural biodiversity. Without natural controls, they often out-compete and crowd out native species leaving a less diverse ecosystem. The State's Invasive Species Council has worked to address the threats of invasive species in New Jersey and regionally. The Plan and Council alls for concerted efforts for both the control of invasive species and bioremediation plans to restore natural biodiversity to the New Jersey environment. Conservation actions such as identifying routes of exposure and introduction of invasive species, improving intra- and interstate monitoring efforts, and prioritizing management and eradication efforts are the basis of restoring New Jersey's natural communities to their native state.

5. Recovery Plans for All Species
In our role as good stewards of the land and flora and fauna that inhabit it, recovery plans for all endangered, threatened, and other rare species must be devised and implemented.

6. Data and Scientific Updates
The foundation of the Plan is sound science. To guide the Plan as it evolves, we will rely upon habitat mapping, species surveys, and scientific modeling to determine the most critical habitats and wildlife in greatest conservation need. Regular monitoring to measure progress and refine approaches is also critical to the Plan's success. The Plan calls for ongoing research of rare wildlife, regular updates of the ENSP's Landscape Map used for regulatory and planning purposes, and the completion of accompanying riparian mapping. In addition, the Plan is considered a dynamic document to be formally reviewed every five years.

7. Challenges in Urban and Suburban Environments
As the nation's most densely populated state, our urban and suburban environment presents unique challenges. Among them – how to manage individuals and pairs of endangered and/or threatened species, such as bald eagles and peregrine falcons, which nest or somehow otherwise adapt to and utilize these environments. The Plan also calls for a concerted effort to identify oases of urban wildlife habitat and, where appropriate, to restore natural resources within urban environments. Other goals include identifying and minimizing toxins found in New Jersey's biota (plant and animal life) and to identify and minimize catastrophic risks to wildlife, such as oil spills.

Our Plan Builds on Four Existing Strengths of the Division of Fish and Wildlife's Endangered Species Program (ENSP)
During the recent history of the ENSP, our staff has devoted significant efforts to four programs that are at the heart of the USFWS requirements for the Plan. While they are more fully described later, they are:

1. The Landscape Project
The Landscape Project is a proactive, ecosystem-level, geographic information systems (GIS) approach to identifying and delineating areas critical for imperiled and special concern animal species within New Jersey. The Division of Fish and Wildlife's (DFW) ENSP began the project in 1994 with the goal of protecting New Jersey's biological diversity by maintaining and enhancing imperiled wildlife populations within healthy, functioning ecosystems. To create the

maps, an extensive database of imperiled and priority species location information is combined with the New Jersey Department of Environmental Protection's (NJDEP) land-use/land-cover data. Critical area maps are available to the public for download in ArcView Shape file format and through the DEP's iMAP Internet function. For more information regarding the Landscape Project, see Section B within the *Overview* and Attachment A.

2. Delphi Status Review

Wildlife species are generally assigned a legal status (e.g., endangered, threatened, stable) by state wildlife agencies. That status confers legal protection or management priority within the state. Most states rely on subjective determinations made by a group of experts. We adapted the Delphi Status Review (or Delphi process) to achieve greater objectivity in determining the relative endangerment or stability of a species' population. A systematic method for reaching consensus among experts, the Delphi Status Review is an iterative process characterized by anonymity among the participating experts and controlled feedback via the principal investigator. The results of this status assessment are used to assign the legal status of species in the state. Thus far, birds, reptiles, amphibians, freshwater mussels, butterflies, moths, dragonflies, and damselflies have gone through Delphi Status Review.

3. State Wildlife Grants Work Plan (SWG)

State Wildlife Grants, established in the fall of 2001, is a federal grant program aimed at preventing wildlife of greatest conservation need from declining to the point of becoming threatened or endangered. The United States Fish and Wildlife Service (USFWS) provides funds to state fish and wildlife agencies for research and planning on these species. In preparation for annual submittals, the ENSP developed a comprehensive work plan identifying both the necessary research, survey and management projects necessary to protect wildlife of greatest conservation need and the partnerships necessary to deliver those actions. This work plan was reviewed by the ENSP's Advisory Committee (ENSAC), which includes representatives of most of the state's non-governmental conservation agencies. The efforts outlined within the work plan have been incorporated into the New Jersey Plan.

4. Endangered and Nongame Advisory Committee (ENSAC)

The ENSAC was established in 1973 under the implementation of the state Endangered Species Act (ESA). The composition of the committee, academic (four seats), conservation group leaders (three seats), public (three seats) and veterinary profession (one seat) was originally set by the ESA and aimed to provide an effective review of the actions and plans of the Endangered and Nongame Species Program (ENSP). The committee also reviews all recommendations of the ENSP to change the status of species. As the meetings are open to the public, the ENSAC provides a regular public review of ENSP actions, plans and recommendations and has been very helpful in identifying the strengths and weaknesses of our work. The ENSAC has reviewed the SWG work plan, Delphi Status Review recommendations, the Landscape Project, and now the iterations of the Plan.

The first draft of the New Jersey Wildlife Action Plan has been reviewed by the state's most respected conservation professionals and therefore represents a consensus on the species of greatest conservation need and the actions necessary to protect them.

The first draft was presented to each of the regional ENSP biologists who were asked to create a more specific strategy for each of five landscapes in the state (Figures 1 and 3). These include the Delaware Bay, the Atlantic Coast, the Pinelands, the Piedmont Coastal Plain, and the Skylands Region, which contains the Highlands and Ridge and Valley geologic provinces. Conservation Zones, smaller areas within each Landscape, were established using watershed boundaries and geographical landscape features determined by ENSP biologists. Threats and goals were then developed along with actions necessary to protect or recover species from threats from three perspectives: statewide; within each of the five landscapes; and within each of the Conservation Zones. Based on these three perspectives, many iterative reviews by our staff yielded the first draft, which was presented for internal and external peer review.

This phase of the review process was initiated with other bureaus within the Division of Fish and Wildlife. After incorporating suggestions from the Bureaus of Freshwater Fisheries, Wildlife Management, Land Management, Marine Fisheries, and Information and Education, a draft was presented to the ENSAC, which began the external peer review. Shortly thereafter, a review was requested from all relevant federal and state agencies, and the state's larger conservation non-governmental organizations (NGOs).

Drafts two through seven incorporated input from peer reviews and public comments represented by a diverse assemblage of groups and organizations involved directly or indirectly in the conservation of New Jersey's wildlife. These comments comprised– to the maximum extent possible – a consensus of the state's wildlife conservation community on the actions necessary to protect species of greatest conservation concern. A list of participants assisting in the development of the Plan can be found in Appendix V.

The official public comment period was held from September 21 – September 28, 2005, during which time, mostly online comments were submitted. The public had been notified through the NJ Register of the September 1 – September 28 initial comment period, but the Plan was not posted until September 21. Due to the limited time frame, however, the ENSP extended the comment period until December 31, 2005, and continued to accept comments through January 15, 2006, for review and potential incorporation into the revised Plan. The extension was broadcast to the public via the Division of Fish and Wildlife's eight list-serves containing approximately 28,000 – 30,000 members, including many who are members of the news media. Although there is certainly some overlap among the recipients, based on the specificity of each list the majority are from different audiences including sportsmen/women, anglers, educators, those interested in rare wildlife, and outdoor writers.

During the thirteen-week public comment period, the Division of Fish and Wildlife received thirty-seven online comments and approximately 300-350 letters. Of these letters, three form letters were sent that had been sent by 250-300 people; nearly 200 people signed one of the letters. The comments were reviewed and summarized into fifty general issues or concerns (Appendix VI). Thirty-eight of these comments indicated opposition to the feral cat issue and

the trap-neuter-release (TNR) programs detailed in the September 2005 version of the NJ Wildlife Action Plan and were of anti-hunting sentiment. The remaining twelve comments consisted of potential partnerships, issues regarding off-road vehicles, emergency response planning, additional research, and etcetera.

The ENSP incorporated many of these comments and recommendations into the current revised version of the NJ Wildlife Action Plan (dated July 26, 2006). Included in the revision is a change in the state's approach to dealing with feral cat colonies and TNR programs. State biologists are currently working with organizations to develop protocols and identify the areas where feral cat colonies would pose the greatest risk and ensuring that local regulations that implement TNR programs avoid these areas or allow for alternatives to TNR. We have not altered our goals and strategies regarding deer hunting because state biologists and conservation partners agree that deer management is a critical component in maintaining healthy forests and biodiversity within our state.

The revised NJ Wildlife Action Plan (dated July 26, 2006) was posted online for review and comments, as the Plan is considered a dynamic document. The citizens of NJ were notified of their opportunity to comment on the Plan through the publication of a notice in the NJ Register and through the Division of Fish and Wildlife's list serves. Comments were reviewed, considered, and, as appropriate, incorporated by the Division of Fish and Wildlife and its associated advisory committees and councils each year. Since then, the Plan has continued to undergo revisions including refinement of actions for clarification and focus on measurable outcomes; the most recent available version of the Plan posted online for public viewing and comment. The state's conservation partners will conduct formal review of the Plan's effectiveness every four – five years at a "partner summit," after implementation of the Plan has begun. The next Partner Summit is expected to take place during the winter of 2010 – 2011, but may be rescheduled to the following winter due to delays in implementation statewide.

The second phase of the process, which is already underway, involves Plan implementation. The NJDFW is sponsoring outreach programs to encourage the use of the Plan by all of the state's conservation, planning and regulatory groups, and citizens.

During the spring of 2006, the Division of Fish and Wildlife met with stakeholders (the state's conservation partners) from around the state to develop an implementation plan for the NJ Wildlife Action Plan. During that process, the NJDFW was able to incorporate additional comments and recommendations regarding the goals and strategies outlined in Section F of the Plan's Overview. The results of these meetings can be viewed within Attachments B and C.

The success of our Wildlife Action Plan depends on our ability to attract resources to implement the Plan through a wide array of existing partners who have influence on wildlife and habitat and new partners who have resources to contribute to the conservation goals.

Our goal is to deliver the Plan to those who have some role in the protection of habitat and/or wildlife or have a mandate to fund conservation initiatives. We want a dialogue that will help us

incorporate actions within the Plan that will facilitate implementation by all relevant agencies and groups. To that end, we have conducted or are conducting two major actions:

1. **Partner Summit:** In spring 2005, we hosted a partner summit to develop the best methods of implementation for all partner agencies and groups. Nine breakout sessions were held within the summit dedicated to important topics, including: Municipal Land-Use Planning, Regional and State Planning, Invasive and Overabundant Species Management, Public Land Management, Land Acquisition (public and private), State and Federal Private Land Incentive Programs, Infrastructure, Habitat Mitigation and Land Use Regulation, and Habitat Restoration and Management. The workshop represented a sincere effort to embrace the ideas of our partners in order to create realistic implementation additions to our Wildlife Action Plan. The ENSP staff incorporated the comments and results of the summit, as well as comments we received from the public, into the Plan. After a final review by the Commissioner of the DEP, the draft Plan was sent to the USFWS for formal review.

Partner Summits will be held every four to five years, after implementation has begun, as a way of monitoring the Plan's effectiveness, and to revisit the Plan's implementation priorities.

2. **Online:** The Wildlife Action Plan will be made available online so that it is easily accessible for all interested citizens. The online Plan is available in a format that enables anyone to find any specific portion of the Plan in which they are interested. NJ citizenry will be able to submit comments and recommendations on a continual basis.

The Plan is a dynamic document and it is our intention to continue to refine and revise the Plan as appropriate. This will result in a Wildlife Action Plan that represents a true consensus of what should be done, and by whom, for the species that are so important to all of us. County libraries will be notified of the federally approved Wildlife Action Plan and provided with the Division of Fish and Wildlife's Web site where it will be made available to the public. Revised versions of the Wildlife Action Plan will be submitted to the US Fish and Wildlife Service as appropriate.

3. **Public Forums and Open-house Opportunities:** The Division of Fish and Wildlife will hold a minimum of three open-house opportunities throughout the northern, central, and southern regions of the state, during 2008 calendar year to share the Wildlife Action Plan with NJ's citizens, provide information and educational opportunities, and recruit partnerships in conservation. Public forums will be scheduled for the year prior to future formal reviews to provide an opportunity for citizens to provide additional comments and recommendations for Plan revisions, gain additional support for the Plan, and continue to develop partnerships at a more local level. The next series of forums are tentatively scheduled to be held during 2010, prior to the first formal review, expected to be held in 2010 - 2011. The third series would be held in 2015, the year prior to the second formal review (2016). Issues raised at the public forums will be addressed during the formal review periods.

B. New Jersey's Landscape Project

The Landscape Project is a proactive, ecosystem-level, geographic information systems (GIS) approach to identifying and delineating areas critical for imperiled and priority concern animal species within New Jersey. The Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP) began the project in 1994 to protect New Jersey's biological diversity by maintaining and enhancing imperiled wildlife populations within healthy, functioning ecosystems.

Landscape Project mapping, the cornerstone of the Wildlife Action Plan, explicitly identifies critical habitat for wildlife of greatest conservation need. New Jersey's critical habitats were delineated by first collapsing the NJ Department of Environmental Protection (DEP) aerial photography-based land-use and land-cover information into five habitat categories: forest, grassland, forested wetlands, emergent wetlands, and beach/dune. Next, contiguous patches of habitats were determined from boundaries between different habitat categories and major roads (county level "500" roads). These habitat patches were then intersected with documented occurrences of nongame wildlife species, which are maintained in Biotics. Biotics is NatureServe's biodiversity data management software, which in New Jersey is managed jointly by the NJ Department of Environmental Protection's Office of Natural Lands Management's Natural Heritage Program and the Division of Fish and Wildlife's ENSP. Occurrence records were – and continue to be – derived from a variety of sources, including ENSP surveys, DEP staff reports, private consultant reports and reports from the general public. Habitat patches were then ranked based on the conservation status of the wildlife records and the following ranks assigned: (5) for federal endangered or threatened species, (4) for state endangered species, (3) for state threatened species, and (2) for wildlife species of special conservation concern. A rank of (1) was assigned to patches that have not adequately been surveyed to determine the presence or absence of rare wildlife. Detailed methodologies regarding species models and mapping methodology are provided in the Landscape Project Report (Niles et al. 2004). NOTE: In the map figure "imperiled species" is a convention adopted by ENSP to capture endangered and threatened together (both federal and state).

The Landscape Project is dynamic and can be used at multiple spatial scales to investigate novel approaches to wildlife conservation and wildlife conflicts. The GIS datasets are available to the public for free, allowing a multitude of users to overlay critical habitat with any other GIS layer important to their project. This has allowed users to incorporate critical habitat maps in their planning processes like never before. Landscape Project mapping is the primary source of endangered, threatened and rare wildlife data to private and public organizations and is currently used for land-use regulation, land acquisition through the NJ Department of Environmental Protection's Green Acres Program, state and private land management, private land trusts' management and acquisition, county and municipal planning, and open space acquisition.

More information about the Landscape Project can be found in Attachment A and is available from the NJ Division of Fish and Wildlife's Web site:

www.njfishandwildlife.com

Or by contacting:

The Landscape Project
NJ Division of Fish and Wildlife
Endangered and Nongame Species Program
P.O. Box 400
Trenton, NJ 08625
(609) 292-9400 or (609) 984-1414 (fax)

Figure 1. Critical landscape habitats identified through the Landscape Map (v2).

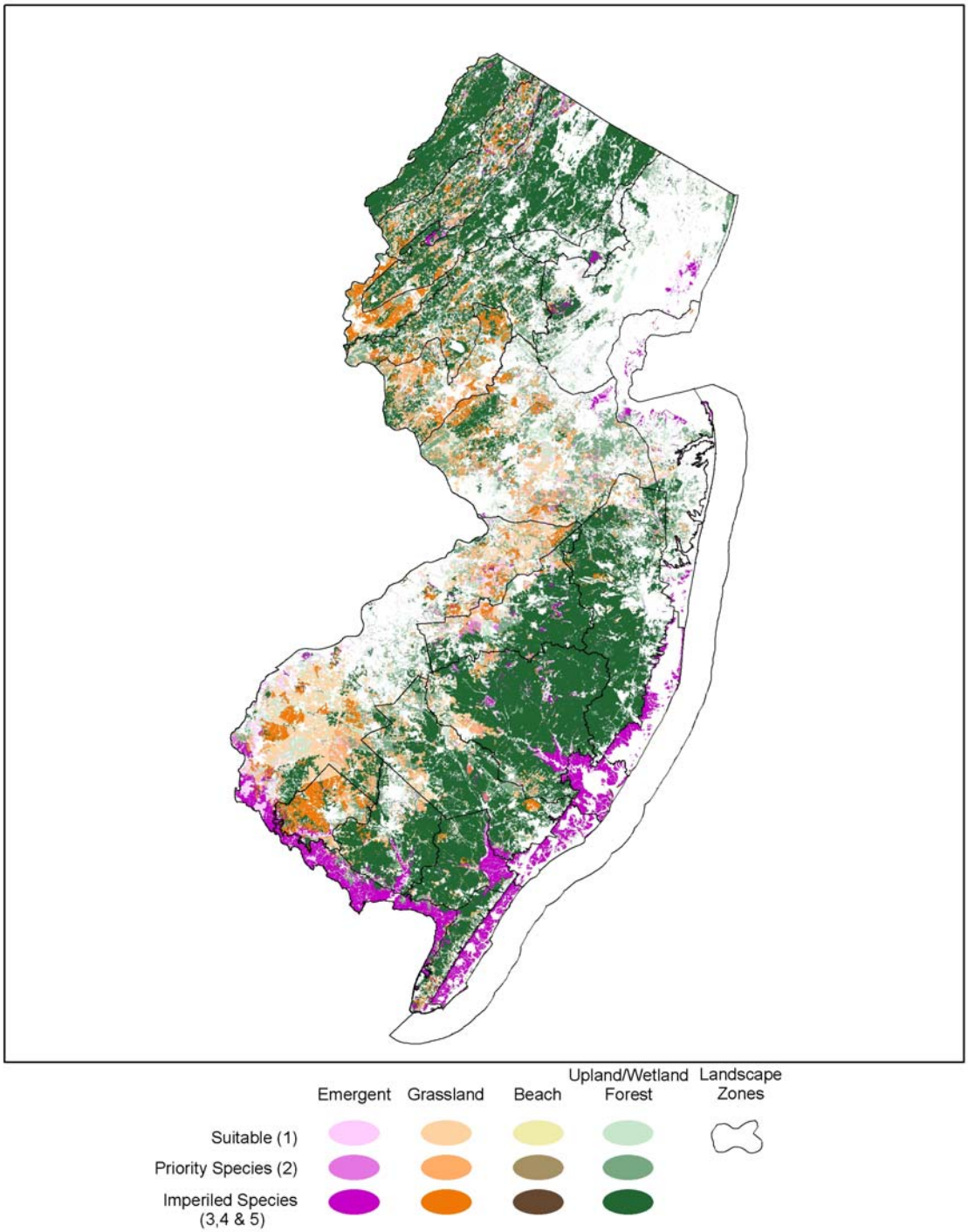
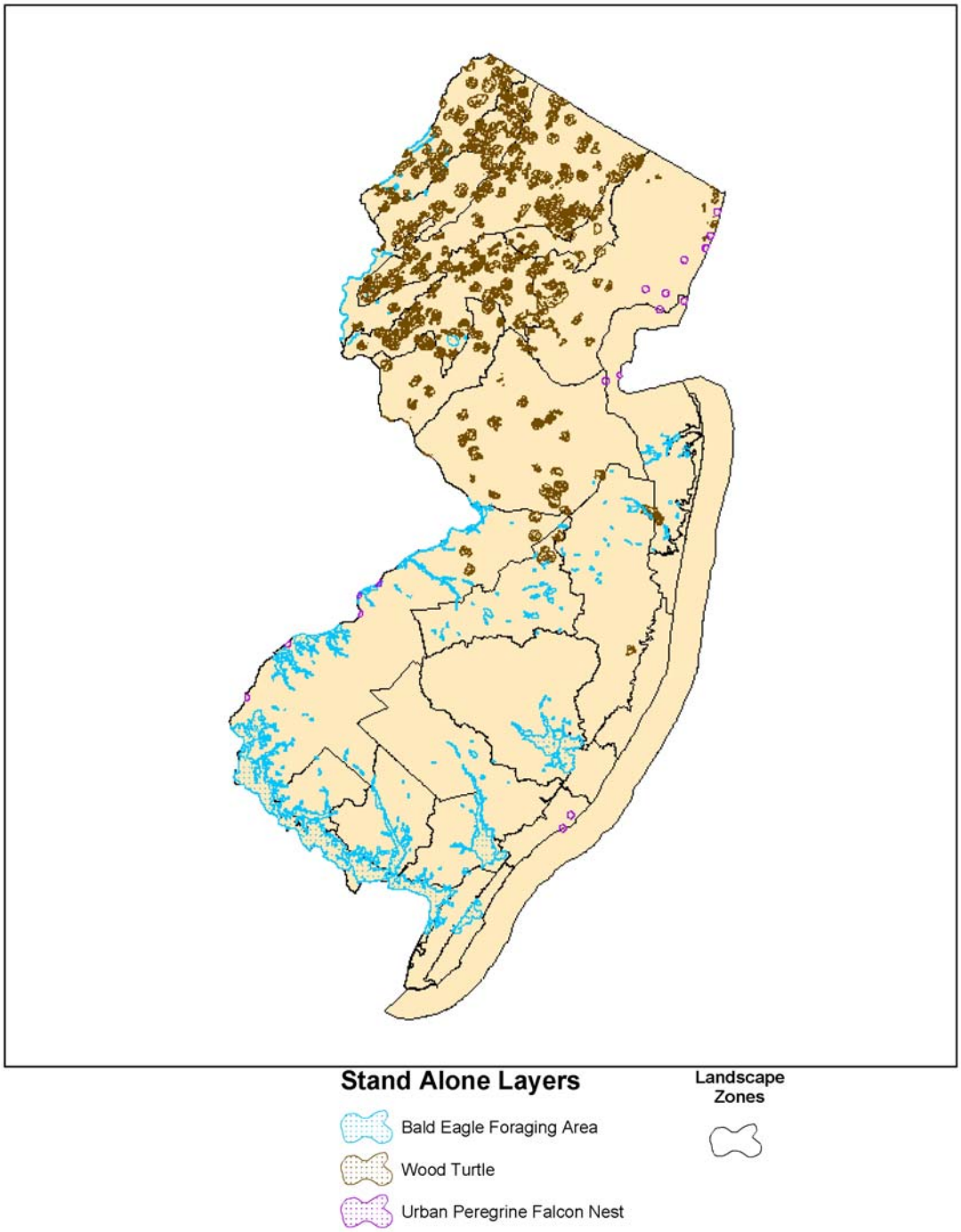


Figure 2. Stand-alone species' specific critical areas identified through the Landscape Map (v2).



C. New Jersey's Landscape Regions and Conservation Zones

Once glacial ice retreated and the Atlantic Ocean stabilized at its present shoreline, New Jersey blossomed into a state of diverse and unique habitats. Today's dunes, beaches, tidal marshes, cedar swamps, thick pitch pine forests, extensive grasslands, peat bogs, maple-oak forests, pitch pine ridge tops, brackish bays, rivers, streams and the Atlantic Ocean support an amazing array of wildlife. That is true despite the fact that New Jersey is the nation's most densely populated state and home to more than eight million people and much of its diverse landscape has been converted for agriculture or development, fragmented, degraded and altered. Nonetheless, there are tremendous opportunities for conservation of its rich array of wildlife and habitats.

In a state with 10 cities of more than 80,000 people and more than 19,165 square kilometers (7,400 sq. mi.), where should conservation be focused? New Jersey's Landscape Project answers that question by identifying areas of greatest conservation need.

Landscape Regions

Land forms, soils, vegetation and hydrological regimes were used to delineate five ecoregions or landscape regions in New Jersey: the Skylands, Piedmont Plains, Atlantic Coastal, Pinelands and Delaware Bay landscapes.

Skylands Landscape

This landscape region combines two of New Jersey's physiographic regions, the Ridge and Valley and the Highlands. It encompasses all or parts of Sussex, Warren, Hunterdon, Somerset, Passaic, Essex, Bergen, and Morris counties. The region contains extensive tracts of contiguous upland and wetland forests that support diverse animal populations including red-shouldered hawk, northern goshawk, cerulean warbler, timber rattlesnake, long-tailed salamander, and the state's only known wintering populations of Indiana bat. Bog turtles and great blue herons inhabit the extensive freshwater wetland systems found throughout the region.

Piedmont Plains Landscape

This landscape region also combines two of New Jersey's physiographic regions, the Piedmont and the Inner Coastal Plains. It encompasses all or parts of Burlington, Gloucester, Salem, Mercer, Middlesex, Monmouth, Hunterdon, Somerset, Union, Essex, Hudson, Passaic, and Bergen counties. It is dominated by the Delaware and Raritan rivers and is characterized by farmed areas, extensive grasslands, fragmented woodlands and tidal freshwater marshes that are among the world's most productive. Imperiled species within this landscape include grassland birds such as the endangered upland sandpiper and woodland raptors such as the barred owl and Cooper's hawk.

Atlantic Coastal Landscape

This landscape encompasses parts of Monmouth, Ocean, Cape May, and Atlantic counties. New Jersey's Atlantic Coast beaches and marshes are among the most productive coastal habitats in the country. Despite heavy development, they support important portions of Atlantic Coast populations of colonial nesting birds, such as common tern, little blue heron and great egret, and endangered beach-nesting birds such as least tern and piping plover. The coastal habitats also

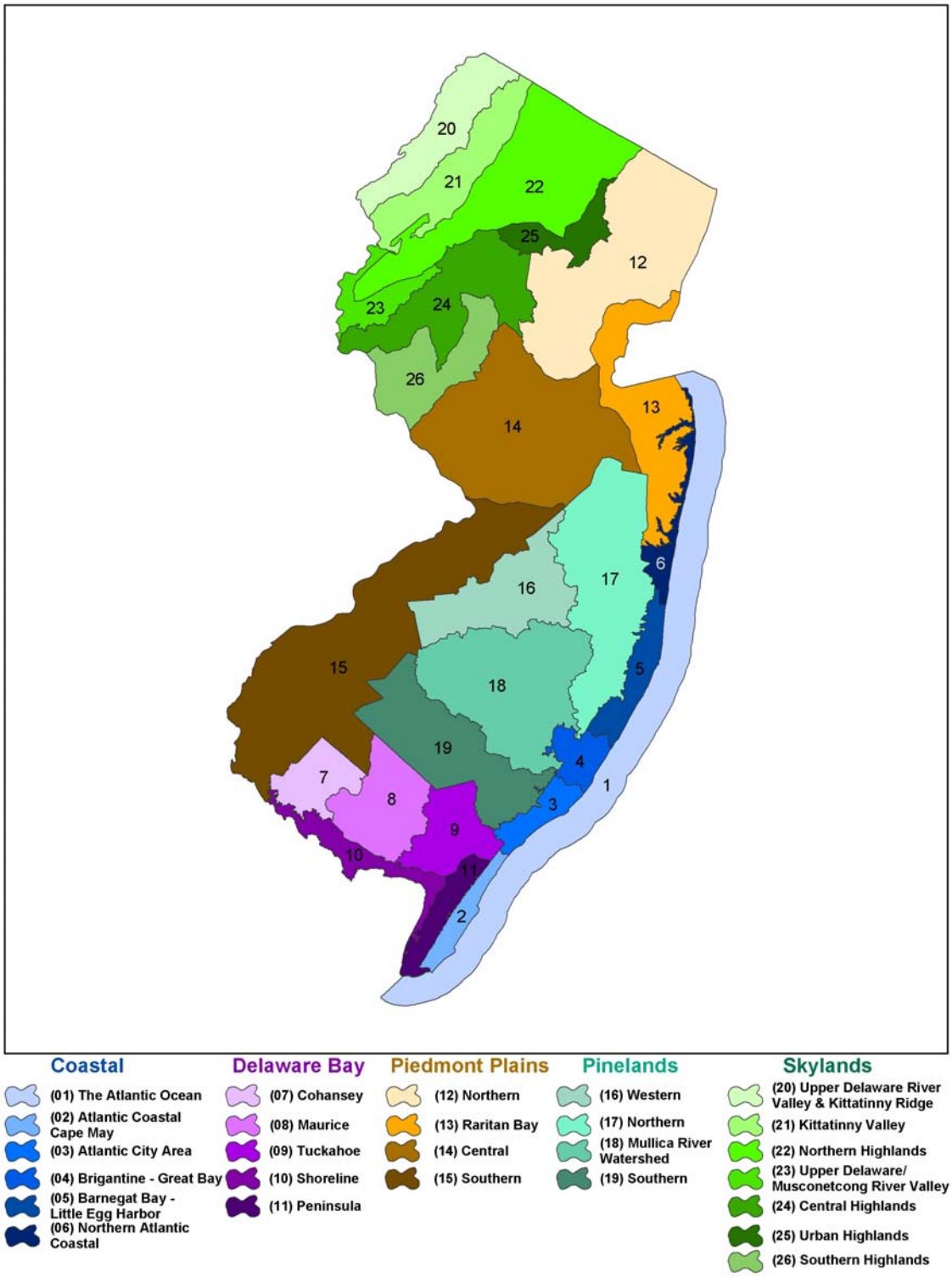
support most of the state's ospreys, peregrine falcons and northern diamondback terrapins, as well as a large number of northern harriers and large concentrations of wintering waterfowl.

Pinelands Landscape
This landscape encompasses all or parts of Atlantic, Ocean, Burlington, Camden, and Gloucester counties. An internationally recognized ecosystem, the Pinelands supports extremely diverse reptile, amphibian and invertebrate populations including northern pine snake, corn snake, Pine Barrens treefrog, Pine Barrens bluet and arogos skipper. Extensive cedar swamps and wetland systems contain numerous insect species, as well as sustainable populations of many neotropical birds. Its waterways support aquatic communities unique among mid-Atlantic states.

Delaware Bay Landscape
This landscape encompasses all or parts of Cape May, Atlantic and Cumberland counties. It features significant populations of bald eagle, barred owl, eastern tiger salamander, Cope's gray treefrog and 30 other endangered and threatened species. The vast woodland tracts of this region are among the largest in the state and support a large portion of New Jersey's neotropical birds and interior-forest bird populations. The extensive saltwater marsh and sandy overwash beaches support a significant horseshoe crab breeding area and shorebird migration, including the red knot, of worldwide ecological significance. Despite the heavy loss of habitat, the Cape May Peninsula remains one of the country's most important migratory "stopovers" for hundreds of bird and insect species. The expansive habitat mosaic of rivers and streams flowing into the tidal Delaware Bay supports concentrations of rare wildlife and wintering waterfowl.

Conservation Zones
Habitats are variable within each landscape region. Therefore, the regions have been further divided into *Conservation Zones* to identify specific habitat threats and conservation goals. The zones were created using geographic (rivers, ridgelines, watershed boundaries, etc.) and manmade features (roads – county level or larger) within each region.

Figure 3. Landscape regions identified by the Landscape Map (v2) and conservation zones within the regions.



D. New Jersey's Most Vulnerable Wildlife

This Plan focuses on species of greatest conservation need and many have a legally defined state status, which conveys a special conservation need.
The Endangered and Nongame Species Program has solicited the input of biologists to determine the status of each of New Jersey's nongame wildlife species by using the Delphi Status Review. It brings experts together to build consensus – in this case, about the condition of nongame wildlife species (and in some cases, game species) in New Jersey. Bird, reptile and amphibian, freshwater mussel and butterfly biologists participated in different Delphi Status Reviews and provided their opinions about the status of New Jersey species as well as justification for designating these species as endangered, threatened, special concern, secure/stable or unknown. Experts considered the distribution and abundance of wildlife, the condition of their habitats and the threats and problems they might face. Consensus was reached and the review process was completed when 85 percent of the experts agreed on a status for a species.

The Endangered and Nongame Species Advisory Committee recommends the legal status for nongame wildlife in New Jersey, and has followed the results of the Delphi Status Review.

The species of greatest conservation need (Appendix I) include those species that have been identified through scientifically sound data and review processes as species in need of special attention because continued (or further) habitat degradation or modification would result in population losses detrimental to the species' existence within New Jersey, regionally or nationally. The Wildlife Action Plan focuses on endangered, threatened, special concern and regional priority species, species of unknown status (based on the Delphi Status Review recommendations and the New Jersey state legal status), and species identified as extirpated as the result of the Delphi Status Review. The Plan also includes game species of regional priority, as well as game species that have limited population status information within New Jersey. Nongame species that have been reviewed through the Delphi process and do not have state or regional status, but have been identified by NatureServe Conservation Status Assessment (NatureServe, 2004) as species with a global element rank of G1-G3, have been included among the species of regional priority (Appendix I, Table W6). In addition, species that have not been reviewed through the Delphi process but hold a global element rank of G1-G3 and/or a state element rank of S1-S3, as identified by NatureServe Conservation Status Assessment and the ENSP, have been included among the species of special concern and regional priority (Appendix I, Table W6); this means they are potentially at risk for state and/or regional listing. Definitions for global and state element ranks are shown in Appendix I and can be viewed through NatureServe's web site: http://www.natureserve.org/explorer/.

The regions where such priority species occur are identified in Appendix I, Tables W3 – W9. A complete list of New Jersey's nongame priority species and their associated legal status, current as of August 2005, is shown in Appendix II. The wildlife species addressed in the Plan are those of greatest conservation concern, specifically those with endangered, threatened, and special concern status in the state. Species of regional priority for which no harvest is permitted are included among the state's species of special concern (Appendix I, Table W6). Through input from DFW's Bureaus of Wildlife Management and Freshwater Fisheries species of regional priority with seasonal harvests within New Jersey have been identified within Table W7

(Appendix I); nongame fish species currently without state or regional status have been identified within Table W8 (Appendix I); and species with seasonal harvests, currently without state or regional status, have been identified within Table W9 (Appendix I). Since, ENSP regularly conducts species status assessments using the Delphi Status Review process, a species legal status can change. Therefore, the most current status can be found at www.njfishandwildlife.com or by contacting the ENSP office.

The Plan consolidates the results of the Delphi Status Review with ENSP-identified jobs, objectives and approaches outlined in the New Jersey State Wildlife Grants Proposal (ENSP, 2002). The Plan also uses the fine-and-coarse-filter approach by grouping nongame and game wildlife species into ENSP-identified management suites, with common objectives and approaches to conservation (Appendix I, Table W10).

Detailed conservation goals and strategies for each of the wildlife species of greatest conservation need are available in the New Jersey State Wildlife Grants Proposal (ENSP, 2002).

E. Threats to Wildlife and Habitats

For a complete literature review on impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Appendix III.
www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Contents

Global threats such as global warming and reduced air and water quality continue to jeopardize the future of our natural systems and quality of life in New Jersey. During the Wildlife Action Plan Implementation Meetings held on February 23 and April 6, 2006, stakeholders and partners in conservation recognized that while global warming and air quality are important issues, the magnitude of these threats are too great for one state to address. However, NJ's partners in conservation acknowledge that in order to determine the effects of global warming on our wildlife and their habitats long-term research and monitoring is required. Therefore when appropriate, future research will collect data addressing global warming threats such as increased water temperatures, rising sea level, vegetation changes, changes in food source emergence (e.g., insects), changes in migratory routes and timing, and appearance and disappearance of climate sensitive species.

Additionally, the NJ Department of Environmental Protection continues to be a strong advocate for decreasing both air and water pollution through strict regulations that will ultimately protect water quality in important waterways that support sensitive species. DEP has been a leader in such regulations and considers protection of our quality of life and natural resources an important priority.

1. National and Interstate Threats:

- Invasive species (both native and exotic terrestrial and aquatic animals, plants, invertebrates, and exotic pathogens) cause significant impacts and permanent loss of terrestrial and aquatic ecosystems. The cost of restoring habitat destroyed by invasive species can be prohibitive and requires persistent and long-term dedicated management. Without swift and significant intervention, losses of natural communities and wildlife may be permanent.
- Suburban "sprawl" and large-acre zoning cause extensive habitat loss and fragmentation. Many communities limit development by creating large-acre zoning. While large-acre zoning (usually five-plus acres) limits the human population within a locality, it dramatically fragments existing habitat, rendering remaining habitat remnants unsuitable for area-sensitive forest and grassland species. Driveways and roads can fragment habitat and limit movement of many wildlife species. Additionally, development degrades patches of adjacent habitat through an increase in predators associated with humans (e.g., raccoons and foxes), and point- and non-point source pollutants (road salt, motor oil, fertilizers, and pesticides). Development may also isolate habitat patches and prevent wildlife movement between patches, which can be particularly devastating to populations that are long-lived and produce few young (such as turtles and snakes). These cumulative impacts of development on wildlife populations and habitats are rarely considered at the regional scale.

- Motorized recreation vehicles on or near public natural lands and waterways (e.g., off-road vehicles and personal watercrafts) cause disturbance and habitat destruction and are major threats to wildlife and their habitats. One of the most destructive aspects of motorized recreation is that it occurs mainly during spring and summer when animals are attempting to breed and plants are in their primary growing season. Acute and chronic noise disturbance can cause animals to abandon suitable breeding areas and/or result in reproductive failure. Motorized vehicles also cause direct mortality of wildlife, especially to reptiles and amphibians.
- Free-roaming and feral house cats kill millions of birds, small mammals and reptiles each year in the United States. Feral cat "colonies" contribute to the problem of anthropogenic (caused by man) wildlife mortality and can pose a serious threat to local wildlife populations. Policies and local ordinances that seek to address the public health, nuisance and animal welfare concerns of free-roaming and feral cats must consider and effectively address impacts to wildlife.
- Oil spills threaten freshwater and salt marsh ecosystems and the wildlife that rely on them. The Atlantic states host an abundance of species that are dependent on riverine and estuarine systems, including larval fish, horseshoe crabs, migratory shorebirds, breeding eagles and large populations of wintering waterfowl. Heavy oiling kills wildlife, but ingestion of lesser amounts of oil impacts reproduction and survival. In addition, the impacts to aquatic habitats are difficult to quantify and monitor.
- Contaminants from point and non-point sources degrade habitat and in wildlife cause developmental and behavioral abnormalities and reproductive failure. Substances from point- and non-point sources (e.g., road salt and oil, residential and agricultural fertilizers/pesticides, PCBs and other environmental estrogens and organochlorines, heavy metals, and municipal and commercial wastes) are sources of contamination that can cause aquatic habitats to become unsuitable for invertebrates and vertebrates, cause physical abnormalities in amphibians and chronic reproductive failure in raptors via embryonic death or wasting disease of their hatchlings.
- Overharvesting of horseshoe crabs has diminished the abundance and availability of horseshoe crab eggs, a critical food source for the red knot *(Calidris canutus ruf*a). The dramatic decline in red knot numbers on the Delaware Bay has resulted in the call for federal listing of the red knot. The strong reliance of red knots on horseshoe crab eggs has been evidenced by the declines in red knots concurrent to the declines in horseshoe crabs and horseshoe crab eggs (Clark et al. 1993).

2. Statewide Threats:

Virtually all of the threats faced by New Jersey's wildlife are ultimately linked to human activities. For convenience or organizational clarity, human impacts can be described as "direct" or "indirect". Direct impacts include intentional killing or destruction of animals or their nests or homes, human disturbance, and collection. Without discounting the importance of direct impacts, indirect human impacts pose the greater threat to wildlife. The majority of these are linked to the pattern of human changes to New Jersey's landscape, especially the vast changes brought about by sprawl development over the past half century. Indirect human impacts include habitat destruction, alteration, fragmentation, invasive species' infestation and contamination. Moreover, the NJ Comparative Risk Project Report, written by an independent panel, listed habitat loss and fragmentation as the top risks to NJ ecosystems.

Human activities resulting in changes, including changes to the landscape, can benefit some species. However, species that benefit from human activity can, in turn, negatively affect other species or their habitats.

Direct Human Impacts

- Illegal collection of reptiles, butterflies, and freshwater mussels.
- Wanton (and illegal) killing of snakes.
- Vandalism to mines and caves supporting colonies of wintering bats, which are highly susceptible to large-scale mortality during hibernation.
- Recreational use of caves and mines poses a major threat to hibernating Indiana and other wintering bats. These disturbances force bats to unexpectedly arouse from hibernation, thereby depleting critical fat reserves needed to support them through the winter.
- Recreational rock climbing and rock scrambling can make habitats unsuitable for habitat-sensitive, cliff-nesting peregrine falcons, and basking/gestating timber rattlesnakes and northern copperheads.
- Recreational use of some beaches disturbs beach-nesting birds, resulting in diminished nesting success and brood survival, and interferes with the foraging and resting of migratory shorebirds.
- Mechanical beach cleaning reduces substrates necessary for foraging by beach-nesting birds and migratory shorebirds.
- Vehicle use on beaches, including permitted private vehicles and “official” vehicles, creates disturbance, harms foraging habitats, can destroy habitats for northeastern beach tiger beetles and causes direct mortality of beach-nesting birds.
- Unlawful off-road vehicle (ORV) use on public land has become a major threat to wildlife habitat. Human disturbance and wildlife mortality from vehicles occur in the most important and intact wildlife habitats in the state. Heavy ORV use renders habitat unsuitable for most wildlife. Other impacts include damage to vegetation, soil compaction, soil erosion and siltation from dirt trails.
- Many commercial fishing practices, including long lines and gill nets, are a threat to sea turtles, whales, pinnipeds (such as seals), pelagic birds, and some fish species such as Atlantic sturgeon. Impacts of aquaculture and back-bay hydraulic crab dredging on marine habitats are largely unmeasured and poorly understood.
- Over-fishing in riparian, estuarine and oceanic systems can reduce reproductive success of colonial waterbirds, bald eagles, ospreys, and red knots due to depleted food resources.
- Personal watercraft and recreational boating can cause reduced reproductive success or abandonment of nesting areas and interfere with bird foraging (waterbirds, bald eagles and ospreys).
- Ship strikes pose a threat to sea turtles, pinnipeds, and especially whales. Ingestion of plastic (pollution/ litter) also threatens these species.
- Burgeoning predator populations, especially of species that are human-subsidized and/or that are accidentally or purposefully provisioned by people (e.g., feral cats, red foxes, crow species, gull species, raccoons, and skunks), severely impair nesting success and productivity of beach-nesting birds, colonial waterbirds, northern diamondback terrapins, freshwater mussels, songbirds, small mammals, reptiles, and amphibians.
- Unleashed dogs may disturb nest sites and breeding areas of birds, reptiles, amphibians, and small mammals.

- Controlled water releases from reservoirs, along with illegal releases from impoundments, may negatively impact fishes, freshwater mussels, dragonflies, and damselflies, and other aquatic organisms by altering natural flow regimes. Water releases can also affect dissolved oxygen levels downstream during summer months.
- Illegal draw-downs of lakes and ponds during the spring can cause desiccation of spawning nests and egg mortality in fishes. Freshwater mussels, amphibians, and other aquatic species are also at risk.
- Although the potential impacts of offshore wind energy development to migratory and pelagic birds, migratory bats, sea turtles, and marine mammals are poorly understood at this time, offshore wind structures may pose significant threats to these wildlife.
- Water intake systems (e.g., power plants) pose a threat through the entrainment and impingement of aquatic organisms.
- Acoustic effects in freshwater, such as pile driving and underwater drilling can deter migrating anadromous fishes such as American shad and river herring.

Development

Development eliminates terrestrial and aquatic species habitat and in most cases is irreversible. Moreover, in New Jersey, natural public lands have become a magnet attracting development that surrounds, isolates, and potentially degrades natural lands. As described above, the impacts on natural communities from adjacent development can be many, but some of the more significant include the following:

- Lotic and lentic systems (e.g., swiftly and slowly moving streams and waterways) are threatened by land development, including erosion and deposition from storm water discharge, alteration of temperature and nutrient regimes from pavement and lawns, ecological disruption from pesticide applications, and decreased flow due to water draw-downs.
- Increased silt loads and shifting stream bottoms caused by erosion threaten freshwater mussel habitats, as do contaminants such as heavy metals, pesticides, and sewage treatment plant effluent. In addition, increased turbidity deters anadromous fish from completing their normal migration to breeding areas.
- Unspoiled headwater streams are one of the most threatened habitats in North America for fishes and aquatic insects, especially rare dragonflies. Removing the forest canopy can increase water temperatures and silt loading, which can reduce dissolved oxygen levels.
- Groundwater withdraws at headwaters can alter stream flow or cause tributaries and seepages to dry completely. At risk are rare dragonflies and damselflies restricted to these habitats.
- Dragonflies, damselflies, and other aquatic invertebrates also are threatened by alteration or removal of upland forests and fields surrounding the aquatic habitat. These adjacent areas provide critical shelter for newly emerged dragonflies and damselflies and are later used for breeding and foraging.
- Clearing upland vegetation from around wetlands exposes wetlands to increased runoff (siltation and contaminants) and increased desiccation and higher temperatures from exposure to wind and sun. It also favors the establishment of invasive and exotic plants.
- Small freshwater wetlands suffer from lowered water tables caused by heavy residential use of ground water.

- Large wetlands become surrounded by development and become degraded from runoff non-point source pollution, impacts from human disturbance, invasive/exotic plants, and introduced mammalian and avian predators, including housecats.
- Removal of snags (e.g., stream cleaning projects), which provide food and shelter for fishes, invertebrates and amphibians, threatens stream communities by decreasing the available detritus that normally accumulates behind stream obstructions.
- Channelization and dredging threatens freshwater mussels, fishes, dragonflies, damselflies, and other aquatic organisms by disrupting stream bottom habitat. These practices also cause higher ranges in tidal volume and a subsequent loss of shallow water habitat, which affects the reproductive success of fish.
- Dams alter the physical, chemical and biological stream environment, sometimes destroying 30-60 percent of the freshwater mussel fauna upstream and downstream of the structure. The most detrimental effect of dams on freshwater mussels, however, is the elimination of host fish species, which disrupts the mussels' reproductive cycles. Dam construction also results in rare stream dragonflies being replaced by common pond species and blocks the migration of anadromous fishes.

Roads

New Jersey's extensive road network fragments habitat, causes significant wildlife mortality and can present significant barriers to wildlife movement. The impact of vehicular mortality on wildlife populations is only beginning to be quantified. However, some of the more significant impacts are:

- Direct mortality of animals that are slow moving (i.e. reptiles, amphibians), long-lived, produce few young, or already have a small population size can severely impact the viability of that population.
- Roads can act as barriers to wildlife dispersal, which can cause inbreeding and prevent movement when habitat is destroyed or becomes unsuitable, resulting in the direct loss of these individuals from the population.
- Declines in freshwater biodiversity have been attributed to in-stream habitat degradation caused by the removal of forest and the construction of roads and impoundments.
- Traffic noise creates disturbances that render adjacent habitats unsuitable for breeding birds.
- Roads promote dispersal of exotic species, degrade the surrounding environment, and tend to result in new developments, deforestation, and habitat fragmentation.
- Runoff from roads and developed areas degrades water quality (contaminants, erosion, silt deposition) and impacts aquatic wildlife and habitats and the terrestrial wildlife that rely upon them.

White-tailed Deer

High densities of white-tailed deer pose a significant threat to forest health and forest regeneration. New Jersey's progressive deer management strategy and the hunter's contribution through increased antlerless deer harvests have reduced the deer herd in many areas of the state. Damage from deer browse coupled with human-related effects described above severely impact some of New Jersey's remaining public and private natural lands. The unintended consequence is the destruction of some of our remaining natural lands.

- Deer directly damage wildlife habitat and can eliminate rare plant communities.

- High numbers of deer find refuge in residential areas or on private land where hunting is not allowed.
- Over-browse by deer eliminates the native shrub layer, which deprives breeding habitat for many species, particularly shrub-nesting birds.
- Deer over-browse creates a favorable environment for invasive plants to germinate and crowd out native species.
- Deer selectively browse on native species, which allows non-native plants to become established and thrive.

Invasive Species and Exotic Pathogens

New Jersey is currently suffering from an onslaught of invasive, non-indigenous species that threaten the state's natural resources and natural diversity. These include terrestrial and aquatic plants and animals (insects, mollusks) and exotic pathogens. These invasives negatively impact our forests, streams, lakes, bays, marshes, and backyards. Over 1,000 non-indigenous plant species have become established in New Jersey and many more occur throughout our region but have not yet found their way into the state. Human actions, both non-deliberate and deliberate, are the primary means of invasive species introductions. Some specific examples that occur statewide include:

- Insects such as the Asian long-horned beetle (*Anoplophora glabripennis*), emerald ash borer (*Agrilus planipennis*), and hemlock wooly adelgid (*Adelges tsugae*) kill off large tracts of trees and may significantly change the composition of our forests.
- Sudden oak death fungus (*Phytophthora ramorum*) may severely restrict oak regeneration within our forests and negatively impact the wildlife that relies on oak mast.
- Japanese barberry (*Berberis thunbergii*), tree-of-heaven (*Ailanthus altissima*), and Norway maple (*Acer platanoides*) likely cause long-term loss of forest regeneration and native understory.
- Common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*) can severely reduce habitat suitability of freshwater and coastal wetlands for many marsh nesting birds and other species such as bog turtle (*Glyptemys muhlenbergii*).
- Autumn olive (*Elaeagnus umbellate* Thun. var. *parvefolia*), Chinese bush-clover (*Lespedeza cuneata*), Japanese honeysuckle (*Lonicera japonica*), and multi-flora rose (*Rosa multiflora*) impede growth of native grasses, shrubs, and forbs, including host plants and nectar sources for many butterflies.
- Non-indigenous aquatic plant species such as Eurasian water-milfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) reduce the diversity of indigenous aquatic plants, are of less value as a food source for waterfowl and deplete oxygen levels in the water.
- The Asian clam (*Corbicula)* is the most widespread exotic bivalve in North America. Often competing for space and food with native freshwater mussels, *Corbicula* in high densities have been implicated in the decline of native mussels.
- Zebra mussels, not yet reported in New Jersey, pose a significant threat to freshwater ecosystems. All aquatic organisms that are subject to attachment would be at risk. Phytoplankton would also be at risk statewide, as would entire ecosystems that depend on them. All inland freshwater ecosystems could experience dramatic changes in habitat structure and food web dynamics.

- Mute swans (*Cygnus olor*) are established throughout New Jersey and are responsible for excessive herbivory to submerged aquatic vegetation in wetland habitats during key portions of the growing season.
- Exotic fish species, such as the flathead catfish and northern snakehead in the Delaware River drainage, can disrupt aquatic ecosystems by competing for food with native predator species.
- The illegal stocking of carp and grass carp can disrupt benthic (bottom-dwelling) communities and severely impact aquatic vegetation.
- European starlings (*Sturnus vulgaris*) and house wrens compete with many species of woodpeckers and eastern bluebirds for nesting cavities, which is usually the limiting factor for these species.

Unsustainable Land Management Practices on both Private and Conserved Lands and Waters

Approximately 21 percent of New Jersey is protected as federal, state and local lands and through conservation organizations and land trusts (e.g., NJ Audubon Society, The Nature Conservancy, The NJ Conservation Foundation). Although these lands are protected from development, only some lands are actively managed for habitat and wildlife protection. Many natural land areas face the threats listed previously, including over-browse of native plants due to high deer populations, invasive plants replacing native vegetative communities and human disturbance in sensitive areas. At sites where active management occurs, management practices vary according to different organization goals and may not be optimal for maintaining ecological integrity of natural communities, promoting regional biodiversity and protecting critical habitats of rare wildlife. Some practices that could potentially harm native species include:

- Forestry practices, including unsustainable clear cutting and even-aged stand management, can result in forests that are low in vegetative structural diversity, low in living and dead biomass, and consequently, low in biological diversity and ecological integrity.
- Vegetation management, including mowing, cutting and herbicide use on utility rights-of-way and roadsides during the breeding season, increases mortality and reduces productivity of many species, especially birds, invertebrates and small mammals.
- Agricultural use of state lands, particularly Wildlife Management Areas, cultivate crops that do not provide habitat for many species of wildlife.
- Insufficient consideration of the ecology of sensitive habitats when selecting and altering areas for human recreational use causes fragmentation and loss of critical habitat for rare and declining wildlife.
- Lack of active management for wildlife diversity.
- Nutrients from fertilizers used for agriculture, primarily nitrogen and phosphorus, can lead to algae blooms and contribute to eutrophication in aquatic systems. Pesticides, as well as waste from livestock, also threaten waterways. Impacts to aquatic systems and rare species from aquacultural activities are largely unknown, but potential exists for significant negative impacts.

F. State-level Conservation Objectives

Contents of the Chapter on the State-level Conservation Objectives

This section identifies the goals and actions (strategies) necessary to address the threats listed in the previous section. In addition, potential partnerships, monitoring programs, and information gaps have also been identified. Moreover, in an effort to emphasize the connection between local and state conservation goals and actions, a "code phrase" has been assigned to each goal that best describes the goals' general focus. These code phrases have also been assigned to the conservation actions found within the conservation zones throughout this document. The code phrases will assist New Jersey citizens in understanding how local conservation efforts enhance statewide conservation strategies.

1. Addressing National, Interstate, and Statewide Threats

All of the threats identified above reduce or eliminate wildlife populations over the long term through destruction and degradation of habitat, or in the short term by direct destruction of individual animals. To address these threats adequately, partnerships between and among non-governmental organizations, state agencies, federal agencies, private organizations and private citizens must be developed and cultivated. While we have identified key partnerships throughout this document, partnerships are typically evolutionary in nature and therefore will change and increase over time. Every citizen in New Jersey can play a powerful role in protecting wildlife throughout the state beginning with his or her own backyard.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

a. Conservation Goals

- ***Priority:*** Identify, restore, and protect unique ecosystem processes including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing. *(Restore habitat - invasives)*
- ***Priority:*** Reduce the adverse impacts of non-native invasive species and over-abundant native species on critical wildlife, natural communities, and habitat quality. *(Conserve wildlife and protect habitat – invasives)*
- ***Priority:*** Conduct long-term monitoring to evaluate habitat and wildlife restoration efforts. *(Evaluate restoration – invasives)*

- Restore and maintain species of special concern wildlife populations through collaborative protection of native species and habitats. *(Conserve wildlife – invasives)*

b. Conservation Strategies

The approach to controlling invasive plants and organisms must be generalized to all agencies and non-governmental organizations (NGOs) and be multi-pronged with identification, eradication and outreach activities carried out concurrently and continually.

- ***Priority:*** Reduce regulatory impediments to restoration and enhancement activities.
- ***Priority:*** Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
- ***Priority:*** Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
- ***Priority:*** Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
- ***Priority:*** Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
- ***Priority:*** Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.
- ***Priority:*** Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by the Landscape Project map.
- ***Priority:*** Develop and recommend "best management practices" (BMPs) for use of biological control agents to reduce non-native or overabundant pests.
- ***Priority:*** Develop species- and habitat- specific BMPs for management of various communities dependent upon disturbance, and incorporate into existing land-management framework (e.g., forestry, wildlife management, stream stabilization, dune stabilization).
- ***Priority:*** Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
- ***Priority:*** Develop species- and habitat- specific BMPs for control of the most common and detrimental invasive species, and incorporate them into existing land-management framework (e.g., forestry, wildlife management, stream stabilization, dune stabilization)
- ***Priority:*** Create and implement a system for reporting and qualifying new locations of priority invasive species.
- ***Priority:*** Create implementation plan for Invasive Species Task Force recommendations when completed.
- Enact legislation to regulate the sale of invasive plants (both native and exotic-native) for ornamental or restoration use. A list of NJ's invasive plants can be found within the appendix of the following web site:
  www.state.nj.us/dep/commissioner/policy/pdir2004-02.htm
  A list of the NJ's 30 most aggressive invasive plants can be found at the following web site:
  www.state.nj.us/dep/parksandforests/natural/heritage/InvasiveReport.pdf

- Develop list of natural processes altered by human presence or activity, (e.g., fire suppression), identify impacted sites on public land and target for pilot work, develop collaborative management techniques to safely restore natural processes using experts and land managers, and evaluate and document results in adaptive management framework.
- Develop dedicated funding to identify and map infestations.
- Develop prioritization framework, based on expert guidance, to evaluate of the aggressiveness of the infestations, ecological importance of the community or habitat, control methods and the likelihood of success.
- Develop funding for an interstate web-based mapping application (e.g., Google Earth) where states can input and/or track new infestations of exotic freshwater fish species, mollusks, aggressive pathogens, and insects.

c. Potential Partnerships to Deliver Conservation

- DFW will coordinate with experts from universities, conservation organizations, government, and the private sector to provide an overall framework and basis for establishing priorities concerning control of terrestrial and aquatic invasive species and to develop strategies to control infestations on protected lands.
- Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) will work with NJ Sea Grant to inform the public about the threat of a zebra mussel infestation and train people to monitor for them.
- DFW will work with state and county agencies (DEP's Division of Parks and Forestry and Office of Natural Lands Management-Natural Heritage Program, county parks and natural areas) and bordering states' agencies to document and communicate exotic terrestrial and aquatic species occurrences.
- DFW will work with the DEP's Office of Natural Land Management-Natural Heritage Program (NHP) to identify and prioritize management strategies of protected lands impacted by invasive species.
- DFW and conservation organizations will work with water watch groups, river keeper organizations, etc. to identify and report exotic aquatic species occurrences and illegal carp stocking.
- DFW and conservation organizations will partner with the US Fish and Wildlife Service to prevent exotic species introductions and minimize their impacts.
- DFW will investigate reports of illegal carp stocking.

d. Monitoring Success

- Evaluate control efforts by incorporating the collection of necessary information into routine activities and develop funding for dedicated monitoring.

e. Information Gaps

- Encourage research on the long-term impacts of invasive species (e.g., changes in soil pH caused by Japanese barberry), effectiveness of control methods and re-colonization rates of restoration sites.

Suburban Sprawl and Large-acre zoning

a. Conservation Goals

- ***Priority:*** Identify and protect breeding, migration, and wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern. *(Protect habitat - sprawl)*
- ***Priority:*** Maintain connectivity of habitats at the landscape scale. *(Corridors - sprawl)*
- Encourage creation and enhancement of wildlife habitat on private lands. *(Enhance habitat – private lands)*

b. Conservation Strategies

The approach to ameliorate the effects of continued development in New Jersey will require a large-scale and long-term perspective and will rely mainly on the planning community with major support and technical assistance from the conservation community.

- ***Priority:*** NJ Division of Fish and Wildlife (DFW) will lead in the training of municipal and county planners to use the Landscape Map to identify critical wildlife habitats for sensitive species and natural systems within their borders.
- ***Priority:*** DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.
- ***Priority:*** Mitigate impacts of development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
- ***Priority:*** Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
- ***Priority:*** Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
- ***Priority:*** DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
- Enact legislation amending New Jersey's Freshwater Wetlands Protection Act to provide larger, more ecologically sound wetlands buffers based upon findings in recent peer-reviewed scientific literature.

c. Potential Partnerships to Deliver Conservation

- Government and non-government natural resource agencies to work with municipal and county planners to: develop Habitat Conservation Plans; incorporate wildlife needs while providing citizens green space; and develop smart growth plans that minimize habitat destruction.

d. Monitoring Success

- Continue land cover trend analyses, every five years or fewer, the New Jersey DEP's Bureau of Geographic Information and Analysis in collaboration with the Rutgers University Center for Remote Sensing and Spatial Analysis. Trend analyses conducted for the period of 1986-1995 predicted total build-out in New Jersey in approximately 32 years. With this analysis as a baseline, land cover change monitoring could be used to evaluate success of changes in land-use planning.
- Evaluate possible measures of success, including increases in habitat area via reduction and mitigation of habitat fragmentation; increases in cluster, in-fill and urban development; increases in habitat connectivity; and reductions in the rate of loss of natural lands from large-acre or "sprawl" development.

e. Information Gaps

- Encourage municipalities to acquire GIS capability and proficiency. Promote the use of the Landscape Project in planning efforts by offering technical training to municipal planning authorities.

Motorized Recreation Vehicles

Reducing illegal off-road vehicle (ORV) use and heavy personal watercraft use in sensitive wildlife habitats will require concerted education and law-enforcement efforts and the establishment of legal riding areas. Because of the funds and effort required, law enforcement should focus on areas that are most used by motorized vehicles and most sensitive for terrestrial and water-dependent wildlife.

a. Conservation Goals

- ***Priority:*** Conduct long-term monitoring to evaluate protection and restoration efforts of both wildlife and their habitats. *(Evaluate restoration - recreational vehicles)*
- ***Priority:*** Identify and actively protect public natural lands and waters with rare wildlife from ORV and personal watercraft use. *(Protect habitat – recreational vehicles)*
- Restore and maintain wildlife populations through the collaborative protection of species and habitats from disturbance and habitat degradation by motorized recreation vehicles. *(Conserve wildlife - recreational vehicles)*

b. Conservation Strategies

- ***Priority:*** Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain funding for additional officers to assist with enforcement.
- ***Priority:*** Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
- ***Priority:*** Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and

public service announcements, and investigate mentoring programs by off-road organizations.

- ***Priority:*** Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
- ***Priority:*** Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
- Exclude personal watercraft from important shorebird roosting, breeding, and foraging areas through designation of "conservation zones" (e.g., northern Barnegat Bay), and alternatively "no landing" zones (e.g., Stone Harbor Point and Champagne Island).

c. Potential Partnerships to Deliver Conservation

- DFW and conservation organizations will work with private landowners that have rare wildlife and significant vegetative communities on their properties to minimize the impact of off-road vehicles (all terrain vehicles, tractors, trucks, dirt bikes, etc.).
- DFW will work with NJ Audubon Society to develop methods to minimize the impact of personal watercraft on avian species.
- DFW will share site information and expertise with state and federal law enforcement to protect sensitive areas and monitor illegal use of off-road recreation vehicles.

d. Monitoring Success

- Staff and law enforcement personnel to qualitatively monitor ORV use and improvement of habitat condition on state lands. A sample of the most critical and heavily used sites may be monitored for recovery of habitat and wildlife diversity.
- Conduct survey of ORV users through recreation associations to determine their level of satisfaction and use of designated ORV areas.

e. Information Gaps

- Investigate the potential of collaborating with ORV user groups to develop outreach materials on environmental impacts of ORV use on natural lands.
- Siting ORV parks continues to be a difficult problem because communities and those involved in low-impact recreation often do not want high-noise, high-impact recreation activities adjacent to homes, parks, golf courses, etc. This relegates ORV parks to remote areas that are most critical for wildlife. Scenarios for siting ORV parks must be investigated to develop the least disruptive and destructive areas for residents, low-impact users and wildlife.

Subsidized Predators

Reducing the impacts on native wildlife of subsidized predators such as raccoons (*Procyon lotor*), red fox (*Vulpes vulpes*), American crow (*Corvus brachyrhynchos*) and free-roaming "owned" and feral cats will require the concerted effort and collaboration of many government and non-government agencies, but must commence with an aggressive and thoughtful public outreach campaign. Such a campaign should be developed via the collaboration of wildlife biologists, the veterinary community, environmental educators and representatives from local and county animal shelters and advocacy groups.

a. Conservation Goals

- ***Priority:*** Reduce the adverse impacts of subsidized predator populations such as raccoons, red fox, American crow, and free-roaming and feral cats on critical wildlife, natural communities, and habitat quality. *(Conserve Wildlife –subsidized predators)*
- Identify and restore more natural predator-prey relationships through the management of subsidized predators and restoration of natural predators. *(Restore habitat - subsidized predators)*

b. Conservation Strategies

- ***Priority:*** Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
- ***Priority:*** Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
- ***Priority:*** Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:
    - A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations.
    - A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    - A model ordinance for regulating feeding of wildlife.
    - A model pet-licensing ordinance.
    - Mapping of colonies to evaluate impact on species of conservation concern.
- ***Priority:*** Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
- Provide educational materials at all public and non-government organization natural land areas.
- Distribute Cats Indoors brochures and available informational material on the hazards of feeding wildlife to all county, state, and local nature/environmental centers and all NGO nature/environmental centers/environmental centers.
- Develop and support research to improve management practices (e.g., predator exclosures and electric fences) that reduce predation on native wildlife.

c. Potential Partnerships to Deliver Conservation

- Government and non-government wildlife biologists, the veterinary community, environmental educators, and animal welfare organizations, local animal control agents, and local and county animal shelters should collaborate on educational materials regarding the negative impact of feral and free-roaming cats on native wildlife and methods for pet owners to minimize those impacts.
- DFW and NJ Audubon Society will continue to work with American Bird Conservancy's "Cats Indoors" program to develop outreach materials, press releases, and partnerships with local conservation organizations.

- DFW will work with and encourage conservation organizations to include educational materials regarding free-ranging house cats and feral cats within their constituency newsletters (e.g., Conserve Wildlife Foundation, NJ Audubon Society, The Nature Conservancy-NJ Chapter).

d. Monitoring Success

- Establish long-term monitoring efforts where concentrations of vulnerable wildlife exist and where active control or management of feral cats is being conducted.

e. Information Gaps

- Pursue a comprehensive peer-reviewed paper compiling results of current research worldwide on the impact of cats to native wildlife.
- Develop and distribute recommendations for control and management of feral and free roaming cats that are sensitive to both animal welfare concerns and effectively protect native wildlife populations.
- Launch a public outreach campaign, possibly through the creation of a thoughtful documentary about cats and wildlife that could be shown on public television stations nationwide.
- Develop a better understanding of the effectiveness of TNR programs in effecting reductions in feral cat populations.

Oil Spills

a. Conservation Goals

- ***Priority:*** Identify and protect breeding, migration, and wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern. *(Protect habitat – oil)*
- Assess, reduce and mitigate the impacts of oil spills on critical habitat. *(Protect habitat – oil)*

b. Conservation Strategies

- Use the Landscape Map as the basis for emergency response planning by prioritizing sensitive habitats according to location and seasonality of spills. Insert the prioritized mapping into maps used by Office of Emergency Response and the U.S. Fish and Wildlife Service.
- Develop specific plans for the highest priority species (Delaware Bay migratory shorebirds, piping plovers, and wintering waterfowl) and most vulnerable habitats (e.g., shorelines of Delaware River and Bay). These specific plans should be simple and be included in the mapping noted above, as biologist input during a spill event will provide the greater detail needed. Update species plans and mapping annually or as needed with printouts from Biotics to reflect the most current species distribution information.
- Hold annual meetings with staff from DEP Office of Emergency Response to incorporate updated information and mapping on priority wildlife areas, and review response actions in previous years' spill events. Review criteria to evaluate the effectiveness of New Jersey's response to oil spills with respect to rare wildlife and sensitive habitats, including area of impact, timeliness and effectiveness of cleanup, and number/species affected.
- Develop methodology to identify all long- and short-term impacts of oil spills on critical habitat and rare species populations in spill areas.

- On a case-by-case basis, determine the possible mitigation strategies and their potential to mitigate for loss and degradation of critical habitats. Make recommendations to the Office of Natural Resource Damages for restoration.
- Evaluate and reduce threats to marine mammals and sea turtles posed by catastropic oil spills, contaminants, and persistent marine debris.
- Ensure marine mammals and sea turtles adequately/appropriately considered in the state's spill response plan.

c. Potential Partnerships to Deliver Conservation

- State and county emergency response planners, local officials, state, federal and non-government biologists and geographic information system (GIS) experts should develop mapping for oil-spill response that prioritizes sites.
- State and federal members, including the Department of Interior (USFWS), US Coast Guard, Department of Commerce (NOAA) and NJDEP Office of Natural Resource Restoration, in addition to a dedicated team comprised of non-government organizations including Tri-State Bird Rescue and Research, Inc., will work to develop the evaluation methodology of New Jersey's response to oil spills. This evaluation method should assess the extent of the areas affected, the timeliness and effectiveness of the response and impacts to wildlife and habitat.

d. Monitoring Success

- Continue to improve the emergency response and clean-up process by reviewing information compiled from spill events and evaluating monitoring criteria.
- Develop a long-term monitoring plan in which wildlife and habitats are surveyed at least one year after a spill to assess whether the ecosystem is still experiencing impacts.

e. Information Gaps

- Long- and short-term impacts to benthic (bottom-dwelling aquatic) communities.
- Long- and short-term impacts on wildlife productivity due to the bioaccumulation of contaminants in food resources.

Contaminants (point and non-point sources)

a. Conservation Goals

- ***Priority:*** Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing exposure to point and nonpoint source contamination. *(Conserve wildlife – contaminants)*
- ***Priority:*** Conduct long-term monitoring to evaluate population viability and protection and restoration efforts of both wildlife and their habitats. *(Evaluate restoration – contaminants)*

b. Conservation Strategies

- ***Priority:*** Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
- ***Priority:*** Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of

actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.

- ***Priority:*** Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

c. Potential Partnerships to Deliver Conservation

- DFW will continue to work collaboratively with the DEP's Divisions of Science, Research and Technology and Watershed Management to monitor water quality and aquatic communities (fish and invertebrates).
- DFW will continue to work collaboratively with Tri-State Bird Rescue and Research, Inc., US Fish and Wildlife Service, and DEP programs to monitor bald eagles for contaminants.
- DFW to work collaboratively with research and management agencies and universities to investigate the role of contaminants as limiting factors to population growth for wildlife of concern.
- DFW's Herptile Atlas and vernal pool volunteers will be enlisted to report deformities in amphibians.
- DFW will continue to monitor and manage bald eagle nest sites through volunteers.
- DFW will continue cooperative work with the DEP to determine the relative threats of known pollution locations and sources, maintaining raptors and amphibians as key indicators of contaminant levels in the state.
- DFW will work with State and federal members, including the Department of Interior (USFWS), US Coast Guard, Department of Commerce (NOAA) and NJDEP Office of Natural Resource Restoration and Site Remediation Programs to build restoration in to hazardous site clean ups and remedies.

d. Monitoring Success

- Reports on contaminants in wildlife will continue to be produced by the DFW.

e. Information Gaps

- Long- and short-term impacts to benthic (bottom-dwelling aquatic) communities.
- Long- and short-term impacts on wildlife productivity due to the bioaccumulation of contaminants in food resources.

Direct Human Impacts on Native Wildlife and Ecosystem Health

a. Conservation Goals

- ***Priority:*** Identify, protect, and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.). *(Protect habitat - humans)*
- Eliminate illegal collection of reptiles and amphibians within New Jersey and the release of unwanted exotic species into New Jersey's natural environment. *(Protect wildlife - humans)*
- Minimize impacts of controlled water releases on fishes, freshwater mussels, dragonflies, damselflies, and other aquatic organisms. *(Protect aquatic wildlife - humans)*
- Minimize impacts of illegal draw-downs by enforcing existing regulations.

- Minimize impacts of water intake systems on aquatic organisms.
- Minimize acoustic effects to anadromous freshwater fishes and marine mammals and turtles.
- Promote public awareness and conservation. *(Education – humans)*
- Minimize impacts of snag removal and stream cleaning on aquatic species. *(Protect habitat–humans)*
- Identify and restore unique ecosystem processes. *(Restore habitat - humans)*

b. Conservation Strategies

- ***Priority:*** Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk of frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
- ***Priority:*** Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
- ***Priority:*** Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.
- ***Priority:*** Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
- Collect rare species' location data and release occurrence data updates semiannually to departmental environmental review staff and other DEP staff as appropriate, and periodically update the Landscape Map with the new occurrence data.
- Develop funding to support a portion of the salary of one conservation officer to investigate reports of illegal draw-downs and enforce existing regulations.
- Review such data as biological assessments from power plants and provide recommendations to minimize impingement/entrainment impacts to wildlife.
- Develop statewide outreach programs to educate citizens about New Jersey's ecosystems, natural communities, and state laws and restrictions.
- Develop responsible ecotourism opportunities to foster appreciation for New Jersey's biological diversity and greater understanding of the economic benefits of wildlife.

c. Potential Partnerships to Deliver Conservation

- DFW, conservation organizations and environmental educators will develop and implement statewide outreach programs to increase conservation awareness about New Jersey's natural history, native wildlife and state laws and restrictions. Encourage the establishment of environmental programs such as Project Wild throughout New Jersey's schools.
- DFW will work with state and federal law enforcement to develop and implement a plan to increase protection at sensitive areas (nests, hibernacula, breeding sites, etc.).
- DFW and conservation organizations will collaborate on survey and monitoring techniques of reptile and amphibian populations.
- DFW will work with rock-climbing organizations to educate their constituents and to minimize disturbance at sensitive areas (gestation and basking sites, nest sites, etc.).

- DFW, conservation organizations, and land trusts will collaborate with citizen resource groups (bird watching, hunt clubs, bird-dog training groups) to monitor and protect preserved lands from unlawful ORV use, illegal collection of reptiles and amphibians, vandalism to critical sites (nests, hibernacula), and illegal dumping.
- DFW will develop a plan to improve the efficiency of receiving and responding to public reports of illegal or unsafe activities/ events. Increase fines where appropriate.
- DFW will work with USFWS to develop a plan to monitor the taking of non-target species by commercial fisheries and determine if alternative methods can be used that will minimize the impact on rare fish.
- DFW will investigate incidents of illegal draw-downs and enforce existing regulations.
- Work with the National Marine Fisheries Service (NMFS) and the USFWS on water intake system impacts.
- DEP will work with water watch groups, river keeper associations, and other organizations to report illegal draw-downs.
- DFW will collaborate on environmental reviews to ensure that seasonal restrictions are applied during migration periods.
- Work with the US Army Corps of Engineers, Delaware River Keeper, Delaware River Basin Commission, US Coast Guard, bridge authorities and other groups on issues related to acoustic effects in waterways.

d. Monitoring Success

- Monitor short- and long-term effects of commercial fisheries' practices on populations offish and bird species of conservation concern.
- Monitor reptile and amphibian populations through volunteer programs (Herptile Atlas, vernal pool project, etc.).
- Continue to monitor wintering bat populations at known hibernacula and monitor human disturbance at potential hibernacula that currently are not protected.
- Continue Mid-Winter Waterfowl Surveys.

e. Information Gaps

- Gather information to determine cumulative impacts on reptile and amphibian populations from direct human activity (e.g., collection, wanton killing, destruction of critical habitat, and illegal draw-down of waterways).

Development

a. Conservation Goals

- ***Priority:*** Identify and protect breeding, migration, and wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern. *(Protect habitat – development)*
- ***Priority:*** Maintain connectivity of habitats at the landscape scale.
- ***Priority:*** Conduct long-term monitoring to evaluate population viability through statewide surveys and atlases, and the effectiveness of protection and restoration efforts of both wildlife and their habitats. *(Evaluate restoration - development)*
- Restore and maintain wildlife populations through collaborative protection of species and habitats. *(Conserve wildlife - development)*

- Minimize impacts of dredging, channelization and dam construction on aquatic species. *(Protect habitat – development))*
- Minimize impacts of snag removal and stream cleaning on aquatic species.
- Restore historic anadromous fish spawning habitat to what it was before dam installation to increase population size. *(Restore aquatic habitat – development)*
- Minimize acoustic effects to anadromous freshwater fishes and marine mammals and turtles.

b. Conservation Strategies

- ***Priority:*** Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
- ***Priority:*** Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
- ***Priority:*** Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.
- ***Priority:*** Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.
- ***Priority:*** Measure the enrollment acreage and effectiveness of backyard habitat management.
- ***Priority:*** Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
- ***Priority:*** Track the acreage and management of land enrolled in habitat enhancement programs administered by NJ Habitat Incentive Team (NJHIT); monitor each site and evaluate the effectiveness of the management technique.
- ***Priority:*** Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.
- Increase the number landowners enrolled in habitat enhancement programs, and the total number of private acres managed for rare wildlife, by expanding the NJHIT. An increase in the size of this team should result in an overall increase in the number of acres that can be placed into a state or federal enhancement program.
- Secure and increase the amount of state funding dedicated to the Division of Fish and Wildlife's Environmental Review Office to provide more thorough and timely reviews of stream cleaning and stream encroachment permit applications.
- Enact legislation amending New Jersey's Freshwater Wetlands Protection Act to provide larger, more ecologically sound wetlands buffers based upon findings in recent peer-reviewed scientific literature.

c. Potential Partnerships to Deliver Conservation

- DFW and the Division of Parks and Forestry (DPF) will work with government and non-government organizations that currently have habitat programs in place to decrease isolation of public natural lands by development.
- Federal, state, and non-government organizations to identify focus sites and educate the public about backyard habitat programs that benefit New Jersey's native wildlife and plant communities.
- DFW is collaborating with the US Department of Agriculture's Natural Resources Conservation Service (NRCS), conservation organizations (NJ Audubon Society, The Nature

Conservancy – NJ Chapter, Ducks Unlimited, Ruffed Grouse Society, Pheasants Forever, Trout Unlimited, Turkey Federation, Quail Unlimited), and the USFWS NJ Field Office to develop a more simplified program for landowners interested in habitat enhancement programs.

- DEP will partner with river keeper associations, water watch groups, etc., so that they will report illegal snag removal or stream cleaning activities.
- DEP will work with the US Army Corps of Engineers, US Fish and Wildlife Service and other groups on issues related to dredging and channelization when appropriate.

d. Monitoring Success

- Conduct large-scale monitoring via land cover change analyses every five years to monitor change in extent, connectivity and fragmentation of habitats statewide. Link this analysis with large-scale monitoring activities for birds, reptiles and amphibians to develop trends for species and habitats.
- Continue to monitor rare reptile and amphibian populations within isolated habitats for presence, genetic isolation and its effects on populations and breeding success.

e. Information Gaps

- Gather information to determine the cumulative impacts of collisions with man-made structures on populations of rare bird species.

Road Mortality of Wildlife

a. Conservation Goals

- ***Priority:*** Identify and protect breeding, migration, and wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern. *(Protect habitat - roads) and (Corridors – roads)*
- ***Priority:*** Conduct long-term monitoring to evaluate population viability and protection and restoration efforts of both wildlife and their habitat. *(Evaluate restoration - roads)*

b. Conservation Strategies

- Create a "Dead on Road" feature label within Biotics for all species tracked in this database. This will help to map and identify areas where wildlife is repeatedly killed along the roadway and will help focus remediation efforts.
- Quantify the use of existing road culverts and stream underpasses by wildlife using standard survey techniques (camera traps, box traps, etc.). Use data from this study to determine how these underpasses might be redesigned to increase their suitable as wildlife passageways.
- Increase the number of DOT projects that are reviewed for impacts to road-vulnerable threatened and endangered species.
- Work with DOT and municipalities to incorporate amphibian migration corridors into local and county plans for development and protection and to increase the number of amphibian migration routes that are monitored (and potentially closed to traffic) during mass migration events in spring.

c. Potential Partnerships to Deliver Conservation

- Government and non-government agencies and engineers from the NJ Department of Transportation can work together to develop methods to minimize or eliminate road mortality at specific sites.
- DFW will work with local and county planners and road departments to consider and incorporate known amphibian migration corridors into perspective Habitat Conservation Plans and Smart Growth plans.

d. Monitoring Success

- Develop funding to conduct seasonal surveys in areas identified as high mortality sites. Collaborative development and implementation of solutions to reduce acute, seasonal mortality at some of these sites presents an opportunity to carry out before-and-after surveys to assess efficacy of solutions.

e. Information Gaps

- Gather information, conduct research and evaluate the effectiveness of under- and over-road passages for wildlife.

High Deer Densities

The best approach for this problem is to encourage private and public landowners including private conservation lands to allow hunting on their properties. These efforts should be accompanied by a public outreach effort stressing the need for deer hunting for effective deer management that includes public presentations by biologists from organizations such as NJ Division of Fish and Wildlife, NJ Audubon Society, and the NJ Conservation Foundation. The joint credibility of these biologists can encourage non-hunting landowners to allow hunting access by educating them about the damage caused by overabundant deer populations.

a. Conservation Goals

- ***Priority:*** Conduct long-term monitoring to evaluate population viability, protection and restoration efforts of both wildlife and their habitat. *(Evaluate restoration - deer)*
- ***Priority:*** Identify, maintain, and restore natural vegetative communities through sustainable, area-specific deer densities. *(Restore habitat - deer)*
- Restore and maintain wildlife populations through collaborative protection of species and habitats. *(Conserve wildlife - deer)*

b. Conservation Strategies

- ***Priority:*** Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
- ***Priority:*** Expand the DFW community-based deer mgmt program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
- ***Priority:*** Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting,

Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.

- ***Priority:*** Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.
- ***Priority:*** Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to ensure implementation.
- ***Priority:*** Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.
- Evaluate current and ongoing research studies and develop and conduct research studies directed at evaluating the efficacy or of contraceptive approaches to managing deer populations.

c. Potential Partnerships to Deliver Conservation

- DFW will continue to work with the Fish and Game Council to include Game Code provisions that increase deer hunter access and hunting opportunities building on the success of the deer management strategy in areas with good hunter access.
- In the context of landowner incentive programs such as LIP and Forestry Stewardship, DFW will work with landowners to develop and implement deer management plans that achieve desired deer densities.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs and other farm conservation programs.
- DFW will work with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands.
- DFW and DEP's Division of Parks and Forestry (DPF) will partner with Rutgers University and other academic institutions to conduct studies necessary to better understand the impacts of deer on biodiversity, forest health and ecosystem processes, and to develop habitat-specific or landscape-specific deer density targets.
- DFW will work with the USDA's NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
- DFW will work with land management agencies at the state, local, and federal levels to implement deer management plans that achieve desired deer densities on lands that they oversee.

d. Monitoring Success

- Monitor forest health and regeneration as an index of success of deer management efforts.
- Continue to monitor deer harvest and deer densities.

e. Information Gaps

- Evaluate effectiveness of contraception methods to control deer populations through review of current literature and assessment of feasibility for use in New Jersey.

Unsustainable Land Management Practices on both Private and Conserved Lands and Waters

a. Conservation Goals

- ***Priority:*** Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop habitat management plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community. *(Silviculture – land management)*
- Minimize impacts of agricultural practices on aquatic waterways, ground-nesting birds, reptiles and amphibians. *(Agriculture – land management)*
- Investigate impacts of aquaculture on critical habitats and wildlife and develop BMPs to minimize negative impacts. *(Aquaculture – land management)*
- Minimize impacts of other potentially deleterious land management practices, such as dune stabilization, stream cleaning, shoreline stabilization, etc., on critical habitats and wildlife. *(Other practices – land management)*

b. Conservation Strategies

- ***Priority:*** Increase staff in the NJ Habitat Incentive Team (NJHIT) to educate and provide technical assistance to private landowners enrolling in Landowner Incentive Programs (LIP).
- ***Priority:*** Increase number of landowners through NJHIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
- ***Priority:*** Develop BMPs or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
- ***Priority:*** Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using GIS and principles of landscape ecology as the foundation.
- ***Priority:*** Increase the number of Category 1 streams justified by E&T species data.
- Minimize impacts of fertilizers, pesticides, livestock, etc., on waterways by maintaining adequate buffers and, when feasible, enhancing riparian areas through stream bank restoration efforts.
- Enact legislation amending New Jersey's Freshwater Wetlands Protection Act to provide larger, more ecologically sound wetlands buffers based upon findings in recent peer-reviewed scientific literature.

c. Potential Partnerships to Deliver Conservation

- DFW will work with DEP's Bureau of Water Monitoring and Standards to upgrade stream classifications to Category One in segments with endangered or threatened aquatic species present.
- DFW will work with landowners to minimize impacts on waterways by maintaining adequate buffers and enhancing riparian areas through stream bank restoration efforts.

- DFW will work with farmers, state and private foresters and land stewards of private, local, state, and federal lands to implement best management practices that will benefit New Jersey's rare wildlife and natural communities (altered mowing, raising mower blades, controlled or "spot" pesticide application, sustainable forestry practices, etc.)

d. Monitoring Success

- Track the amount of acreage that is enrolled in the various federal and state programs that encourage best management practices.
- Track invasive species removal and re-growth.

e. Information Gaps

- Acquire historic and current data from the Division of Parks and Forests regarding the location, date, and type of silvicultural or other management practice conducted on public lands.
- Identify areas impacted by invasive species.

2. Endangered, Threatened, and Rare Wildlife

New Jersey's nongame wildlife list (as identified under Endangered and Nongame Species Conservation Act (Act), N.J.S.A. 23:2A-1 et. seq; N.J.A.C. 7:25-4.17) currently does not include arthropods, mollusks or fish unless they have been listed as federal or state endangered or threatened. The Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP) believes that there are species of special concern within these suites that are in need of protection and management assistance and have included them among the species listed within the Plan. The ENSP intends to address this disparity within the Act and include fish and arthropods on the nongame list in the near future.

Part I of the State Wildlife Action Plan focuses wildlife and habitat conservation goals on New Jersey's endangered, threatened and rare wildlife. Species of state concern have been identified within the wildlife tables W2 – W6 in Appendix I and include federal endangered and threatened species, state endangered, threatened, and species of special concern, and species of regional priority.

a. Conservation Goals

- ***Priority:*** Restore populations of endangered and threatened wildlife to stable levels that allow their delisting through population management, protection of critical habitat, and habitat restoration and enhancement. *(Conserve wildlife – rare wildlife)*
- Pursue habitat restoration and enhancement to benefit wildlife species. *(Enhance habitat – rare wildlife)*
- Identify summer distribution, habitat use, and migratory corridors for inter- and intrastate migratory wildlife species of conservation concern (birds, bats, marine mammals, fish) and develop and implement strategies to protect these areas. *(Protect habitat – rare wildlife)*
- Identify critical wildlife habitat to protect or buffer to accommodate sea-level change. *(Protect habitat – rare wildlife)*

b. Conservation Strategies

- ***Priority:*** Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
- ***Priority:*** Develop and implement recovery plans for species of greatest priority based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
- ***Priority:*** Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.
- Develop a list of priority sites/regions for promoting habitat conservation (through such practices as acquisition, conservation easements and landowner incentives) in areas that are needed to meet the habitat requirements of wildlife at restored and viable population levels.
- Develop a monitoring program to determine the success of habitat creation and restoration projects and develop improvements to current restoration technologies.
- Reduce state regulatory impediments to improving beach, dune, and coastal wetland habitats for beach nesting birds.
- Work with Rutgers University's Center for Remote Sensing and Spatial Analysis to develop predictive modeling and GIS mapping to identify areas along the coast that need protection and/or buffering in the event of significant sea-level rise.
- Initiate and/or work with other agencies or organizations to research the effects of offshore energy projects (wind turbines) on avian species and marine mammals.
- Enact legislation amending New Jersey's Freshwater Wetlands Protection Act to provide larger, more ecologically sound wetlands buffers based upon findings in recent peer-reviewed scientific literature.

c. Potential Partnerships to Deliver Conservation

- DFW will coordinate with species experts from universities, conservation organizations, government and private sectors to participate in the Delphi process to review and classify species status.
- DFW will develop new species information in partnership with the US Fish and Wildlife Service, universities, conservation organizations such as NJ Audubon Society, NJ Conservation Foundation and The Nature Conservancy-NJ Chapter, regional wildlife planning groups, and private consultants to track wildlife trends. Develop species recovery goals and plans with assistance from these groups and individuals.
- DFW will maintain a corps of Citizen Scientist volunteers who collect data on species presence and abundance, contributing to wildlife trend information and data that supports the Landscape Project's critical habitat designations.
- DFW will identify significant habitats for endangered and threatened wildlife on public and conservation lands and coordinate with land managers to enhance habitats.
- DFW will identify significant habitats on private lands (particularly those adjacent to public and conservation lands) and work with landowners to promote management beneficial to rare wildlife.
- DFW will work with regional biologists to develop the research initiative to identify migratory corridors for migrating bats.

- DFW will work with researchers along the east coast to identify migratory routes for marine mammals and develop plans to protect these critical corridors.

d. Monitoring Success

- Regularly review the population status of native nongame wildlife to evaluate trends and re-evaluate official status designations.
- Regularly review species recovery and habitat goals predicted to support recovered populations.

e. Information Gaps

- Pursue information on species occurring in the state whose statuses are designated as "unknown."
- Pursue research necessary to establish recovery goals relative to population, productivity and habitat requirements.

3. The Landscape Project

For additional information regarding the Landscape Project, see Attachment A or visit our web site: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

a. Conservation Goals

- ***Priority:*** Identify and protect breeding, migration, and wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern. *(Protect habitat – Landscape Project)*

b. Conservation Strategies

- ***Priority:*** Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.
- ***Priority:*** Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available.
- ***Priority:*** Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition and land planning at all levels of government and non-government organizations.
- Dedicate staff in DFW and/or NRCS to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using the Landscape Project and principles of landscape ecology as foundation.
- Recommend that partners at National Wildlife Refuges, military bases, and other public lands integrate the Wildlife Action Plan strategies and actions into their existing site plans as they come up for renewal and revision.
- Refine Landscape Project mapping for use at municipal, county and regional levels for use in habitat conservation planning (e.g., regional HCPs).

c. Potential Partnerships to Deliver Conservation

- DFW will continue coordinating with landscape ecology experts to review and adapt the methodology applied in the Landscape Project habitat mapping and species modeling.
- DFW will maintain a corps of Citizen Scientist volunteers who collect data on species presence and abundance, contributing to wildlife trend information and data that supports the Landscape Project's critical habitat designations.
- DFW will coordinate with state experts, the National Bird Monitoring Committee, Partners In Flight, and other regional and national efforts to integrate new and existing data into national and regional planning.
- DFW will identify significant habitats on public and conservation lands and coordinate with land managers to enhance habitats. DFW will identify significant habitats on adjacent private lands and work with landowners to promote management beneficial to rare wildlife.
- DFW will continue to work with Department of Environmental Protection (DEP) agencies to apply the Landscape Project to guide regulatory protection of habitats.
- DFW will work with conservation organizations, the Association of NJ Environmental Commissions, county and local governments, and private citizens to apply Landscape Project planning statewide.

d. Monitoring Success

- Track habitat protection and loss relative to Landscape Project designations.
- Track the populations and distribution of rare species and adapt the Landscape Project's conservation strategies as needed.
- Collect data on habitat parameters to identify trends and adapt management techniques as necessary to reach rare wildlife population and habitat goals.

e. Information Gaps

- Continue to improve accuracy of base map land use/land cover.
- Pursue rare species information for habitat parcels that have the rank of 1 (meets minimum area requirement but has no known species occurrences) in Landscape Project mapping.
- Educate private citizens and conservation and government organizations about reporting occurrences of rare species.

4. Migratory Stopover and Important Bird Areas Planning

a. Conservation Goals

- ***Priority:*** Identify, monitor, and conserve key migratory corridors and stopover locations for migratory birds. *(Corridors – migratory birds)*
- Conserve sites critical to breeding and wintering birds. *(Protect habitat – migratory birds)*

b. Conservation Strategies

- ***Priority:*** Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
- ***Priority:*** Annually monitor shorebird populations along the Delaware Bayshore stopover.

- ***Priority:*** Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.
- ***Priority:*** Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
- ***Priority:*** Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.
- ***Priority:*** Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers and other "human-made" tall structures.
- Identify critical habitat for migratory birds using parameters of proximity to Atlantic and Delaware Bay coasts and patch size (in areas away from the coast), among others. Circulate the resulting map of critical habitat for migratory birds to land protection agencies to add priority to land preservation efforts. Use CAFRA regulations to provide some habitat protection and to mitigate for habitat losses.
- Raise public awareness about the value of habitat for birds and other wildlife using backyard wildlife habitat programs, migration events, and feeder and nestbox programs.
- Continue to conduct the annual Mid-Winter Waterfowl Survey and the Atlantic Flyway Breeding Waterfowl Survey using standardized methods.

c. Potential Partnerships to Deliver Conservation

- DFW will work with public land managers, NJ Conservation Foundation (NJCF), The Nature Conservancy-NJ Chapter (TNC), other landowning conservation organizations and private landowners to create and enhance habitats for migratory birds.
- DFW will engage NJ Audubon Society (NJAS), National Audubon chapters in NJ, NJCF, TNC, and Citizen Scientists to act as advocates and monitors on behalf of local IBAs.
- DFW will continue collaboration with state wildlife agencies, the International Wader Studies Group, the Royal Ontario Museum, the US Fish and Wildlife Service, and the Canadian Wildlife Service to carry out shorebird research and surveys on the Delaware Bay, Arctic breeding grounds, and South American wintering grounds.
- DFW will continue collaboration with state wildlife agencies, Partners in Flight, and other regional and national organizations to protect and enhance stopover habitat vital to regional and global bird populations.
- DFW will collaborate with the US Fish and Wildlife Service and the Atlantic Flyway Council to conduct the Mid-Winter Waterfowl and Breeding Waterfowl Surveys.
- DFW will collaborate with the US Fish and Wildlife Service, Atlantic Coast Joint Venture, and universities to identify key staging areas for waterfowl.

d. Monitoring Success

- Compare new survey results to previous surveys to assess trends in abundance, distribution, and habitat use.

5. Freshwater Riparian and Aquatic Species

Currently, the ENSP has developed critical wildlife habitat mapping that identifies important upland, wetland and grassland areas statewide. The next phase of the Landscape Project is the Riparian Landscape Project, which will develop the riparian component of critical habitat mapping to protect species that are not well represented in existing habitat layers. The Bureau of Freshwater Fisheries current work on stream classifications through an integrated biotic index they are performing will provide valuable data for developing the riparian mapping. Freshwater mussels, nongame fishes and Odonata (dragonflies and damselflies) are obligate aquatic species ("that breed exclusively in aquatic habitat (and occur in New Jersey's rivers, streams, lakes and ponds. Water quality degradation, habitat loss and/or alteration and loss of essential riparian areas threaten species within these groups.

a. Conservation Goals

- Pursue habitat restoration and enhancement to benefit wildlife species. *(Enhance habitat – riparian species)*

Freshwater Mussels

a. Conservation Goals

- Protect freshwater mussel species through long-term monitoring, stream classification upgrades and the development of management plans. *(Protect habitat – mussels)*

b. Conservation Strategies

- Conduct statewide surveys using timed searches for listed and priority freshwater mussel species in all previously unsurveyed historic locations and suitable habitats with documented host fishes.
- Monitor populations of listed and priority species and develop a freshwater mussel management strategy that would include stream bank restoration, increased water quality protection, and possible relocation efforts into previously occupied, suitable areas.
- Incorporate occurrence information into the Biotics database and develop models for listed species to be used in the Landscape Project's aquatics coverage.
- Recommend to the Bureau of Water Monitoring and Standards stream segments that warrant Category One status based on listed freshwater mussel species present. C1 recommendations will be provided to BWMS on an annual basis.
- Produce freshwater field guide that includes species profiles, color plates, a key to New Jersey species, and range maps. The field guide will be used as a training tool for volunteers working on a freshwater mussel atlas. The guide will also be distributed to water watch groups, state agencies, academic institutions, environmental commissions, and other interested parties.
- Enact legislation amending New Jersey's Freshwater Wetlands Protection Act to provide larger, more ecologically sound wetlands buffers based upon findings in recent peer-reviewed scientific literature.

c. Potential Partnerships to Deliver Conservation

- DFW will work with the DEP's Bureau of Water Monitoring and Standards to recommend stream classification upgrades in areas where listed mussels occur.

- DFW will work with adjacent states to incorporate New Jersey data with existing neighboring states' data and provide contiguous range maps of critical habitats across state boundaries.
- DFW will work with private landowners, government agencies and non-government organizations (NGOs) and conservation organizations to protect riparian areas through stream bank restoration efforts and land management practices.
- DFW will work with the US Fish and Wildlife Service to protect and restore dwarf wedgemussel populations.

d. Monitoring Success

- Regularly review the population status of priority freshwater mussel species to evaluate trends and re-evaluate official status designations.

Nongame Fish Species

a. Conservation Goals

- Determine species status for unregulated fishes using the Delphi Status Review and revise New Jersey nongame wildlife lists (Act, N.J.S.A. 23:2A-1 et. seq; N.J.A.C. 7:25-4.17) through state rulemaking process to include endangered and threatened species. *(Status – fish)*
- Protect listed freshwater species through identification of critical areas, stream classification upgrades, and/or development of management plans with the NJ Department of Environmental Protection, Division of Fish and Wildlife's Bureau of Freshwater Fisheries (BFF) that include long-term monitoring. *(Protect habitat – fish)*
- Incorporate occurrence information into the Riparian Landscape Project, develop species models and identify critical areas. *(Monitor wildlife - fish)*

b. Conservation Strategies

- Recommend to the Bureau of Water Monitoring and Standards stream segments that warrant Category One status based on listed fish species present. C1 recommendations will be provided to BWMS on an annual basis once species are listed through the Delphi Process.
- Determine species status of nongame fish every five years through Delphi Status Review.
- DFW will conduct/support shortnose sturgeon research in the Delaware River, including studies to locate nursery areas for early life stages, population analysis, and acoustic tracking to determine areas of the river utilized by the population.
- DFW will develop management plans for Endangered and Threatened nongame fish species when status is established through the Delphi Review and state rulemaking process.

c. Potential Partnerships to Deliver Conservation

- DFW will work with DEP's Bureau of Water Monitoring and Standards to recommend stream classification upgrades in areas where listed fish occur.
- DFW will enlist the assistance of species experts to assess species status for regulatory and recovery purposes.

d. Monitoring Success

- Regularly review the population abundance, productivity and distribution of priority species to evaluate trends and re-evaluate official status designations and monitor recovery efforts.

Odonata (Dragonflies and Damselflies)

a. Conservation Goals

- Protect listed Odonata through long-term monitoring, stream classification upgrades, and development of management plans. *(Enhance habitat – odonata)*

b. Conservation Strategies

- Complete the listing process for Odonata based on results of the Delphi Status Review and Endangered and Nongame Species Advisory Committee recommendations.
- Increase funding for baseline Odonata surveys, with a focus on rare species within this taxonomic group.
- Develop species models for rare Odonata and incorporate occurrence information into the Riparian Landscape Project.
- Begin mapping stream segments with endangered or threatened Odonata species present and seek Category One upgrades for these segments.
- Enact legislation amending New Jersey's Freshwater Wetlands Protection Act to provide larger, more ecologically sound wetlands buffers based upon findings in recent peer-reviewed scientific literature.

c. Potential Partnerships to Deliver Conservation

- DFW will work with DEP's Bureau of Water Monitoring and Standards to recommend stream classification upgrades in areas where the larval stage of listed Odonata occur.
- DFW will work with private landowners, government agencies and non-government organizations such as NJ Audubon Society (NJAS), NJ Conservation Foundation (NJCF), and The Nature Conservancy-NJ Chapter (TNC) to protect riparian areas through stream bank restoration efforts and land management practices.

d. Monitoring Success

- Regularly review the population status of priority Odonata species to evaluate trends and re-evaluate official status designations.

6. Game Species of Regional Priority and Concern

The Division of Fish and Wildlife's Bureau of Wildlife Management is responsible for the development and maintenance of a productive, diversified wildlife resource and the habitat on which that resource depends. This mandate is accomplished through a variety of scientifically sound management and research programs and provides wildlife related recreational opportunities for the citizens of New Jersey. In this Plan, game species of regional priority and game species of concern have been identified within wildlife Table W7 and Table W9, respectively, in Appendix I.

a. Conservation Goals

- Restore declining populations of game species to viable levels. *(Conserve wildlife – game species)*
- Maintain sustainable populations of all current game species of conservation concern in New Jersey. *(Conserve wildlife – game species)*
- Pursue habitat restoration and enhancement to benefit wildlife species. *(Enhance habitat – game species)*

b. Conservation Strategies

- Establish population level goals for game species and maintain at desired levels through monitoring population vital rates, identify limiting factors, and adapting management to achieve those goals.
- Establish population level goals and maintain them at levels that complement viable functioning ecosystems.
- Establish population level goals for river otter and maintain at desired levels through monitoring population vital rates, identification of limiting factors, and adaptive management.
- Identify and map critical river otter habitat and promote habitat conservation in these areas through such practices as habitat acquisition, landowner incentives and conservation easements.
- Develop research to investigate the use of such variables as water quality, fish and Odonata occurrences and other habitat attributes as correlates to river otter occurrence.

c. Potential Partnerships to Deliver Conservation

- Develop best management practices (BMP) for game species habitats in partnership with the US Fish and Wildlife Service, US Department of Agriculture-Natural Resources Conservation Service, universities, conservation organizations (e.g., Ducks Unlimited, Ruffed Grouse Society, NJ Audubon Society), state and county mosquito commissions, regional wildlife planning groups, and private consultants. Ensure that BMPs reflect a holistic approach that accounts for the needs of all wildlife sharing the same habitat and maintains ecological and community integrity.
- Maintain a corps of Wildlife Conservation Corps volunteers that assist in game species monitoring programs.
- Identify significant habitats for game wildlife of conservation need on public and conservation lands and coordinate with land managers to enhance habitats that maintain ecological integrity.
- Identify significant habitats on private lands (particularly those adjacent to public and conservation lands) and work with landowners to promote management beneficial to regional priority game species without negatively affecting endangered, threatened, or special concern species and their habitats.
- Work with DEP's Bureau of Water Monitoring and Standards to recommend stream classification upgrades in areas where river otters occur.
- Identify significant habitats for river otters on public and conservation lands and coordinate with land managers to enhance habitats.

- Work with fur-trapping organizations to obtain otter carcasses for population monitoring purposes.

d. Monitoring Success

- Regularly review the population status and trends of game species and adjust hunting and trapping regulations as necessary.
- Evaluate how populations of game species of conservation concern respond to habitat management programs and incorporate findings into future habitat management decisions.

e. Information Gaps

- Evaluate and improve monitoring programs for enigmatic (elusive) game species.

7. Long-term Population Monitoring

a. Conservation Goals

- ***Priority:*** Conduct long-term monitoring to evaluate population viability through statewide surveys and atlases and to determine the effectiveness of protection and restoration efforts of both wildlife and their habitats. *(Monitor wildlife – long-term monitoring)*
- Review and analyze management efforts focused on the restoration of unique ecosystem processes. *(Evaluate restoration – long-term monitoring)*

b. Conservation Strategies.

- ***Priority:*** Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following:
    - Breeding Bird Atlas
    - Breeding Bird Survey
    - Delaware Bay Migratory Shorebird Survey
    - Bald Eagle Midwinter Survey
    - Herptile Atlas
    - Calling Amphibian Monitoring Program
    - Fish Monitoring-Streams and Ponds
    - Freshwater Mussel Atlas
    - Mid-Winter Waterfowl Survey
    - Atlantic Flyway Breeding Waterfowl Survey
    - DFW Bobwhite Call-Count Survey
    - Woodcock Call-Count Survey
    - DFW Beaver-Otter Survey
    - Migratory Game Bird Banding Programs
    - Colonial Waterbird Survey
    - Beach Nesting Bird Survey
    - Site-specific Fish Monitoring Programs
- ***Priority:*** Complete and implement the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.

c. Potential Partnerships to Deliver Conservation

- DFW will work with national coordinators at the US Geological Survey (USGS) to maintain adequate Breeding Bird Survey (BBS) and Calling Amphibian Monitoring Program (CAMP) survey routes in New Jersey to track trends.
- DFW will continue to work with NJ Audubon Society to support and improve the BBS.
- DFW and research-based conservation organizations will train volunteers to be knowledgeable in species identification, survey methodologies and data recording.
- DFW will work with universities, local naturalists and other state agencies to incorporate all available data into centralized databases (primarily Biotics).
- DFW will continue partnership with NJAS and the Citizen Scientist Program to recruit skilled volunteers and carry out bird surveys.
- DFW will develop a plan with the USGS-Bird Banding Lab for monitoring bird populations using bird banding on a broad scale.
- DFW will work with adjacent states to incorporate New Jersey data with existing neighboring states' data and provide contiguous range maps of critical habitats across state boundaries.
- DFW will continue to work with other wildlife agencies, Partners in Flight, and other organizations to coordinate and collaborate on the monitoring of birds at a regional and, eventually, continental scale.
- Work with the USFWS, USGS, and Atlantic Flyway Council to complete surveys and banding for migratory game birds of conservation concern.

d. Monitoring Success

- Evaluate trends of long-term monitoring for suitable species and suites of species and evaluate the power of methodologies to achieve certainty levels. Apply databases to Landscape Project mapping to evaluate trends in distribution relative to habitat trends.

8. Adaptive Management Practices

a. Conservation Goals

- Apply best management practices (BMP) for wildlife and habitat resources in the state, monitor effectiveness and modify BMPs as necessary.
- Maintain Landscape Map database and species based models; improve models as more data become available.
- Monitor research and data evaluation techniques and modify as needed.

b. Conservation Strategies.

- Evaluate and modify, when appropriate, monitoring and management strategies for species of greatest conservation need on private and protected lands, and share effectiveness of management strategies with conservation partners at a maximum of four-year intervals.
- Evaluate the effectiveness of management strategies used in landowner incentive programs through monitoring species response to management annually for the duration of the agreement and modify management as necessary.
- Review species based models as information is available, determine efficacy within Landscape Map and revise as appropriate.

- Develop on-line reporting mechanism for public land managers to share successes and failures with others and revise habitat management strategies accordingly.

c. Potential Partnerships to Deliver Conservation

- DFW will work with federal, state, and local agencies, NJ Audubon Society, the NJ Conservation Foundation, the Nature Conservancy-NJ Chapter, other conservation non-governmental organizations (NGOs), and local and private land stewards to incorporate adaptive management practices on lands managed for species of greatest conservation need.
- DFW and research-based conservation organizations will work to analyze and improve on-going habitat and wildlife management strategies on protected lands.
- DFW will apply adaptive management to habitat restoration and management projects on private land.
- DFW will work with research-based conservation organizations, and federal and state researchers to assess and modify current research and management objectives for species of greatest conservation need.

d. Monitoring Success

- Continue to assess research and management techniques and maintain information-sharing relationship with appropriate researchers within the state and region.
- Employ adaptive management techniques to evaluate Wildlife Action Plan implementation.

9. Review of Wildlife Action Plan

The NJ Department of Environmental Protection, Division of Fish and Wildlife (DFW) developed the Wildlife Action Plan with assistance from numerous organizations (Appendix V) and public input. Participation in the development of the Plan by large, member-based organizations such as NJ Audubon Society, the Nature Conservancy-NJ Chapter, and Ducks Unlimited, representing their constituencies throughout NJ, provided an additional approach to incorporating the needs and concerns of NJ's citizens. In addition, many natural resource management-focus and planning organizations, such as watershed groups, riverkeepers, Pinelands Commission, the National Park Service, and many others, helped coordinate goals and strategies to ensure that the Plan includes the needs of various organizations focused on more localized conservation efforts. Through a series of meetings, the Wildlife Action Plan has emerged as a truly inclusive and comprehensive strategy focused on the long-term viability of NJ's rare wildlife and ecological communities.

a. Conservation Goals

- ***Priority:*** Ensure that conservation activities of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are consistent with the Plan. *(Management – Plan)*
- Wildlife Action Plan is an on-going, dynamic document, to be reviewed every five years. *(Evaluate progress – Plan)*

b. Conservation Strategies

- ***Priority:*** The most current version of the Plan will be linked to the most current version of the Landscape Project mapping and will be continually available for review and interactive use on the DFW Web site with an open invitation to submit comments.
- ***Priority:*** Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the Endangered and Nongame Species Advisory Committee (ENSAC), and a wildlife summit in which adaptive management will be built into the revision.
- ***Priority:*** Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the ENSAC, the Fish and Game Council, and the Marine Fisheries Council.
- ***Priority:*** DFW will work with federal, state, county, municipal, and private land managers to incorporate the goals and strategies of the NJ Wildlife Action Plan into current management plans by the first formal review in 2011.
- Updated lists of species of conservation concern, referencing the state lists of endangered, threatened and special concern wildlife, and those species recognized as high priority by regional conservation plans will be incorporated into Plan revisions and clearly identified through a maintained "Plan revisions list."

c. Potential Partnerships to Deliver Conservation

- DFW will host a Wildlife Summit every five years with statewide conservation and environmental organizations, federal, state, and local governments, and environmentally based academia to review successes and failures of Plan and develop additional conservation goals.

d. Monitoring Success

- The level of participation in the regular Summit events, in which all partners will have opportunities to evaluate and revise the Plan, may measure success of the Plan review process.

VI. Landscape Assessments and Conservation Strategies

Atlantic Coastal Landscape

Contents of the Chapter on the Atlantic Coastal Landscape

The Atlantic Coastal landscape consists of barrier islands and beaches, tidal salt marshes, rivers, shallow bays and lagoons along New Jersey's coastline. The landscape includes the eastern edge of Monmouth, Ocean, Atlantic, and Cape May counties, and the Atlantic Ocean. Excluding the ocean, the landscape covers 40,366 hectares (155.8 sq. miles).

A. Ecological Units in the Atlantic Coastal Landscape

The Atlantic Coastal Landscape is within the New Jersey Outer Coastal Plain (232Ab) in the Middle Atlantic Coastal Plain Section.

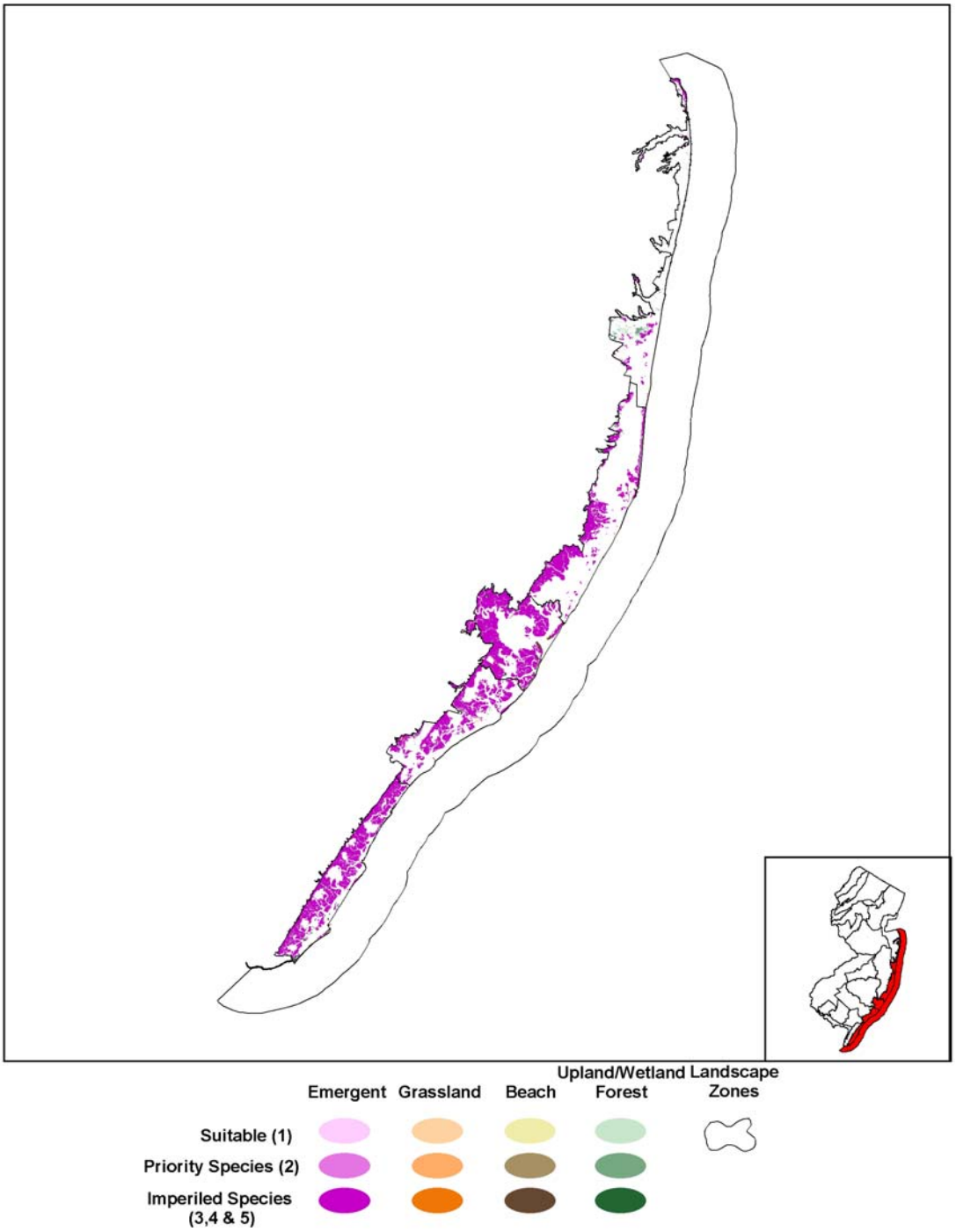
B. Geology and Climate

The Atlantic Coastal Landscape is within the Coastal Plain physiographic province. The landscape's dynamic barrier islands are reformed by erosion and deposition of beach sand by waves and currents, while rivers deposit mud and sand in the bays and estuaries that support the extensive tidal salt marshes. The Atlantic Coastal landscape spans the entire eastern edge of the New Jersey Outer Coastal Plain, where the average temperature varies from 10.5 to 12.2ºC (51 to 54ºF) with a growing season of 180 to 225 days, and the average annual precipitation is between 101-117 centimeters (39.6 to 46 inches).

C. Habitats of the Atlantic Coastal Landscape

Beaches, dunes, tidal salt marshes, brackish bays, river estuaries, barrier islands, and the ocean characterize the Atlantic Coastal landscape (Figure 4). The heavily developed barrier islands have vast beaches and dunes (1,346 hectares, 5.1 sq. mi.), fragmented upland forest, including scrub-shrub (2,515 hectares, 9.7 sq. mi.), and grasslands (121 hectares, 0.4 sq. mi.). The salt

Figure 4. Critical landscape habitats within the Coastal Landscape and associated conservation zones as identified through the Landscape Map (v2).



marshes (36,384 hectares, 140 sq. mi.) and back-bays persist in the shadow of beachfront resorts. The Holgate and Little Beach units of Forsythe National Wildlife Refuge, as well as portions of Island Beach State Park and the Sandy Hook Unit of Gateway National Recreation Area, provide examples of how the barrier islands looked before development, with an extensive primary and secondary dune system and maritime scrub-shrub and forest communities. It is important to note that habitats identified as "forest" and "forested wetlands" habitats on the Landscape Maps include scrub/shrub habitat. The landscape is the eastern edge of the Atlantic Flyway and provides important habitat for migrating and breeding birds, as well as for wintering waterfowl and seabirds. The Atlantic Ocean supports New Jersey's marine wildlife, including fish, turtles, whales, seals, dolphins, and pelagic bird species.

The Priority Conservation Zones in the Atlantic Coastal Landscape are:

(1) Atlantic Coastal Cape May
(2) Atlantic City Area
(3) Brigantine - Great Bay
(4) Barnegat Bay - Little Egg Harbor
(5) Northern Atlantic Coastal
(6) The Atlantic Ocean

Priority conservation zones were delineated based loosely on watershed management area boundaries and sub-watershed area boundaries, grouped or adjusted to incorporate geographic and geological features and to accommodate significant conserved land boundaries. Similarities in the degree of development and the aerial extent of inland watershed drainage also influenced the grouping of the watershed areas.

The Atlantic Coastal Cape May conservation zone includes the entire Atlantic coastal portion of the Cape May watershed management area, except that only the barrier beach and dune areas are included south of the Cape May Canal. The Atlantic City Area conservation zone includes nearly the entire Atlantic coastal portion of the Great Egg Harbor River watershed management area adjusted to exclude lands administered as part of the Forsythe National Wildlife Refuge. The Brigantine - Great Bay conservation zone includes the entire Atlantic Coastal portion of the Mullica watershed management area. In addition, the southernmost sub-watershed area of the Barnegat Bay watershed management area was included to capture all of the lands administered as part of the Forsythe National Wildlife Refuge and all of the lands included in the Great Bay Wildlife Management Area. The Barnegat Bay – Little Egg Harbor conservation zone is comprised of all of the Barnegat Bay watershed management area except the portion included in the Brigantine – Great Bay zone as noted above and excluding the northernmost sub-watershed area (Barnegat Bay – north). The Northern Atlantic Coastal conservation zone includes the entire Atlantic coastal portion of the Monmouth watershed management area plus the Barnegat Bay – north sub-watershed as noted above. Finally, the Atlantic Ocean conservation zone includes all of the open ocean areas bordering the Atlantic Coastal Landscape extending out to the 3-mile limit under state jurisdiction.

D. Wildlife of Greatest Conservation Need of the Atlantic Coastal Landscape

Successful management of the Atlantic Coastal Landscape species and habitats is essential to the conservation in New Jersey of beach nesting birds, colonial waterbirds (except great blue herons), ospreys, marine mammals, pelagic birds, and Atlantic sturgeon. It also provides critical wintering and migratory habitat for a variety of waterfowl including the world's largest concentration of wintering Atlantic brant and American black ducks. The Atlantic Coastal Landscape also plays a crucial role in the conservation of Northern diamondback terrapin, peregrine falcons, northern harriers, black rails, Northeastern beach tiger beetles, migratory shorebirds, migratory songbirds, and coastal marsh birds. In addition, this landscape plays an accessory role in the conservation of Cope's gray treefrogs, Fowler's toads, eastern box turtles, forest-dwelling bats, pied-billed grebes, and bald eagles.

The Atlantic Coastal Landscape of New Jersey supports 16 federal endangered or threatened species including piping plover, northeastern beach tiger beetle, and whales and sea turtles associated with New Jersey's coast. This landscape also supports ten state endangered species, five state threatened species, and 52 species of special concern or regional priority. Several game species, most notably selected waterfowl species, have been assigned priority status. The state endangered species are the bald eagle, American bittern, black skimmer, least tern, northern harrier, peregrine falcon, pied-billed grebe, sedge wren, short-eared owl, and Cope's gray treefrog. Black rail, black- and yellow-crowned night herons, red knot and osprey are the state threatened species. The American oystercatcher, common tern, little blue heron, red-throated loon, ruddy turnstone, eastern box turtle, and northern diamondback terrapin are among the state species of special concern and regional priority. The beaches and dunes are nesting habitat for black skimmers, least terns, piping plovers, and other beach nesting birds. The beach is also habitat for the proposed reintroduction of the northeastern beach tiger beetle. Red knot and other migratory shorebirds, as well as songbirds, raptors, and butterflies, stop in the Atlantic Coast Landscape during migration. Bald eagles, ospreys, and peregrine falcons, coastal marsh birds, waterfowl, and colonial waterbirds nest and forage in the salt marshes and meadows. Northern diamondback terrapins can be found in the tidal marshes, while raptors and Cope's gray treefrogs inhabit upland forested wetlands. The region's forests and riparian areas also host summer and migratory populations of forest-dwelling bats and may contain habitat suitable for summer colonies of Indiana bats. Harbor seals, harbor porpoises, whales, sea turtles, pelagic birds and waterfowl, and anadromous fish species inhabit the Atlantic Ocean and coastal bays.

The following tables list the wildlife of greatest conservation need, the suites of wildlife, and the conservation opportunity areas to conserve them in the Atlantic Coastal Landscape. The wildlife are prioritized by federal endangered and threatened, state endangered, state threatened, and special concern and regional priority status.

Prioritized List of the Wildlife of Greatest Conservation Need and their Location in the Atlantic Coastal Landscape

Table C1. Federal Endangered and Threatened Species*

Common Name	Federal Status& Regional Priority	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Mammals							
Blue whale	E						I
Fin whale	E						I
Humpback whale	E						I
Indiana bat	R	R**	R**	R**	R**	R**	
Right whale	E						I
Sei whale	E						I
Sperm whale	E						I
Birds							
Piping plover	T & RP	I	I	I	I	I	
Roseate tern	E/T & RP				R		
Reptiles							
Bog turtle	T				R		
Green sea turtle	E/T	I	I	I	I	I	I
Hawksbill sea turtle	E	I	I	I	I	I	I
Kemp's ridley sea turtle	E	I	I	I	I	I	I
Leatherback sea turtle	E	I	I	I	I	I	I
Loggerhead sea turtle	T	I	I	I	I	I	I
Insects							
Northeastern beach tiger beetle	T			I	R	I	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife.
**Potential presence.
T: Federally threatened species.
E: Federally endangered species.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table C2. State Endangered Species

Common Name	Regional Priority	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Birds							
American bittern	RP	R	R	R	R	R	
Bald eagle	T	I	I	I	I	I	
Black skimmer	RP	I	I	I	I	M	
Least tern	RP	I	M	I	I	I	
Northern harrier		I	I	I	I	M	
Peregrine falcon		M	M	M	M	I	
Pied-billed grebe	RP			I	I		
Sedge wren	RP	M	M	M	M		
Short-eared owl	RP	I	I	I	I		
Amphibians							
Cope's gray treefrog		M		M	M		

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table C3. State Threatened Species

Common Name	Regional Priority	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Birds							
Black rail	RP	I	I	I	I		
Black-crowned night-heron	RP	I	I	I	I	I	
Osprey		M	M	M	M	M	
Red knot	RP	I	I	I	I	I	
Yellow-crowned night-heron	RP	I	I	I	I	I	

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table C4. Nongame Species of Conservation Concern

Common Name	Conservation Status	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Mammals							
Harbor porpoise	RP	M	M	M	M	M	M
Harbor seal	RP	M	M	M	M	M	M
Marsh rice rat	RP	R	R	R	R	R	
Southern bog lemming	RP	R	R	R	R	R	
Birds							
American golden-plover	RP	M	M	M	M	M	
American oystercatcher	RP	I	I	I	I	I	
Audubon's shearwater	RP						M
Black tern	SC/RP	M	M	M	M	M	
Bridled tern	RP						M
Caspian tern	SC	M	M	M	M	M	
Cattle egret	RP	I	I	I	I	I	
Chimney swift	RP	I	I	I	I	I	
Common barn owl	SC	M	M	M	M	M	
Common tern	SC/RP	I	I	I	I	I	
Forster's tern	RP	M	M	M	M		
Glossy ibis	RP	I	I	I	I	I	
Great blue heron	SC/RP	M	M	M	M	M	
Great crested flycatcher	RP	M	M	M	M	M	
Great egret	RP	M	M	M	M	M	
Greater shearwater	RP						M
Greater yellowlegs	RP	M	M	M	M	M	
Green heron	RP	M	M	M	M	M	
Gull-billed tern	RP	I	I	I	I	I	
Horned grebe	RP						M
Horned lark	SC	M	M	M	M	M	
Hudsonian godwit	RP	M	M	M	M	M	
King rail	SC/RP	M	M	M	M		
Least bittern	SC/RP	R	R	R	R	R	
Little blue heron	SC/RP	I	I	I	I	I	
Manx shearwater	RP						M
Marbled godwit	RP	M	M	M	M	M	
Marsh wren	RP	M	M	M	M	M	
Nelson's sharp-tailed sparrow	RP	M	M	M	M	M	

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Birds (continued)							
Northern gannet	RP						M
Purple sandpiper	RP	M	M	M	M	M	
Razorbill	RP						M
Red-throated loon	RP						M
Royal tern	RP	M	M	M	M	M	
Ruddy turnstone	RP	I	I	I	I	I	
Saltmarsh sharp-tailed sparrow	RP	I	I	I	I	I	
Sanderling	SC/RP	M	M	M	M	M	
Seaside sparrow	RP	M	M	M	M	M	
Semipalmated sandpiper	RP	I	I	I	I	I	
Snowy egret	SC/RP	I	I	I	I	I	
Tricolored heron	SC/RP	I	I	I	I	I	
Whimbrel	SC/RP	M	M	M	M	M	
Willet	RP	M	M	M	M	M	
Wilson's phalarope	RP	M	M	M	M	M	
Reptiles							
Eastern box turtle	SC	M	M	M	M		
Northern diamondback terrapin	SC	I	I	I	I	I	
Amphibians							
Fowler's toad	SC	M	M	M	M	M	
Fish							
Atlantic sturgeon	SC*/RP	R	R	R	R	R	R

* Federal species of special concern
SC: Species of special concern as identified within the state.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table C5. Game Species of Regional Priority

Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Regional Priority	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Birds							
American black duck	RP	M	M	M	M	M	
Atlantic brant	RP	M	M	M	M	M	
Black scoter	RP	R	R	R	R	R	R
Bufflehead	RP	M	M	M	M	M	
Canada goose (Atlantic population)	RP	M	M	M	M	M	
Canvasback	RP	I	I	I	I	I	
Clapper rail	RP	M	M	M	M	M	
Common eider *	RP	R	R	R	R	R	R
Greater scaup	RP	I	I	I	I	I	
Harlequin duck*	RP	R	R	R	R	R	R
Lesser scaup	RP	I	I	I	I	I	
Long-tailed duck	RP	R	R	R	R	R	R
Northern pintail	RP	I	I	I	I	I	
Surf scoter	RP	R	R	R	R	R	R
Virginia rail	RP	R	R	R	R	R	
White-winged scoter	RP	R	R	R	R	R	R

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.

I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table C6. Fish Species

Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Regional Priority	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Fish							
Hickory shad		X	X	X	X	X	X

X: Species present. Management strategy not yet determined.

Table C7. Game Species

Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Regional Priority	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Mammals							
River otter		M	M	M	M	M	
Sora rail		R	R	R	R	R	

M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table C8. Suites of Wildlife and their Location in the Atlantic Coastal Landscape

Common Name	Atlantic Coastal Cape May	Atlantic City Area	Brigantine - Great Bay	Barnegat Bay - Little Egg Harbor	Northern Atlantic Coastal	Atlantic Ocean
Mammals						
Forest-Dwelling Bats	X	X*	X*	X*	X*	
Mammal inhabitants of Wetland, Marsh and Bog	X	X	X	X	X	
Pinnipeds	X	X	X	X	X	X
Whales						X
Birds						
Beach Nesting Birds	X	X	X	X	X	
Coastal High marsh Birds	X	X	X	X	X	
Coastal Low-Marsh Birds	X	X	X	X	X	
Colonial Waterbirds	X	X	X	X	X	
Migratory Shorebirds	X	X	X	X	X	
Migratory Songbirds & Raptors	X	X	X	X	X	
Pelagic and Seasonally Pelagic Birds	X	X	X	X	X	X
Waterfowl	X	X	X	X	X	X
Reptiles						
Reptiles of Special Concern	X	X	X	X	X	
Sea Turtles	X	X	X	X	X	X
Amphibians						
Amphibians of Special Concern	X		X	X		
Fish						
Anadromous	X	X	X	X	X	X
Insects						
Northeastern beach tiger beetle**			X	X	X	

*Potential presence
** Federally listed, proposed reintroduction

X: Species suite occurs within identified landscape region.

E. Threats to Wildlife and Habitats of the Atlantic Coastal Landscape

The barrier islands of New Jersey's coastal landscape are heavily influenced by human alteration. Efforts to stabilize barrier islands, including jetties, groins, bulkheads, beach replenishment projects, and intense dune management (including excessive dune fencing and unnecessary beach grass planting where adequate storm protection already exists), interfere with the natural geological processes needed to create and maintain habitat for beach strand species. While most developable land in the coastal landscape has been built, continued in-fill development threatens the remaining scrub-shrub and forested habitats important to migratory songbirds, raptors, and butterflies. This development also creates barriers for movement for amphibians and reptiles such as the northern diamondback terrapin and increases disturbance to important foraging and nesting habitats for beach nesting birds and colonial waterbirds. Salt marshes and other coastal wetland habitat has been destroyed or severely altered as a result of coastal development and management to control mosquitoes and/or tidal flow, resulting in negative or unknown effects on native species. Mechanical beach raking reduces foraging habitat for beach nesting birds and migratory shorebirds and destroys breeding habitat for northeastern beach tiger beetles.

Barrier beaches and back-bay waters are meccas for human recreational activity. The resulting disturbance to nesting and foraging birds leads to diminished nesting success and brood survival for beach nesting birds, colonial waterbirds, osprey, and others. Vehicle use on beaches, including permitted private and "official" vehicles, creates disturbance, harms foraging habitats, can destroy habitats for northeastern beach tiger beetles, and can cause direct mortality for beach nesting birds. Boating and personal watercraft activity inflicts disturbance on nesting and foraging colonial waterbirds, osprey and others.

Many commercial shipping and fishing enterprises cause direct mortality to whales, sea turtles, and other marine species. Low to mid-frequency active sonar, along with other anthropogenic (human generated) sound sources, threatens marine mammals by disrupting navigation, foraging and communication abilities. Overexploitation of riparian, estuarine, and marine fisheries are not only a threat to specific fish species, but may also have ecosystem impacts that are inimical to species such as colonial waterbirds, the bald eagle, osprey, and others. Environmental impacts of aquaculture and back-bay hydraulic crab dredging are largely unmeasured and poorly understood. The effects of offshore and inshore wind energy projects (towers) on avian species, especially songbirds and seabirds, and possibly bats, are unknown but may be a cause of mortality due to collision. Depending on where they are sited, offshore structures associated with wind energy projects may also have impacts on marine mammals and sea turtles.

Human enterprise in the watersheds that feed estuaries has increased pollution from point-sources and run-off into estuarine areas. Contaminants such as PCBs, pesticides and heavy metals pose threats to aquatic species and ecosystems, and impact reproductive success of bald eagles, ospreys, peregrine falcons, waterfowl and water birds. Large oil spills, although only periodic events, are likely to continue to occur because of the state's proximity to major shipping lanes up the Delaware River and into the New York City Harbor. Spills loom as a possible threat to a wide range of coastal species, with potentially catastrophic results.

Human activities also negatively affect ecosystems by introducing invasive or exotic plants and animals and sustaining native species whose populations have expanded beyond that which would occur naturally. Invasive and/or exotic plants or wildlife (e.g., phragmites, Japanese sedge, mute swan) diminish habitat suitability of coastal marsh and dune habitats for wildlife, and reduce the ecological integrity of natural communities. Over-abundant native wildlife species (e.g., resident Canada goose, greater snow goose, gull species), if left uncontrolled, also have potentially negative impacts on habitat quality and populations of other critical wildlife. Burgeoning subsidized predator populations, (e.g., red fox, crow species, gull species, raccoon, striped skunk, free roaming "owned" or feral cats), severely impair nesting success and productivity of beach nesting birds, colonial waterbirds and northern diamondback terrapins.

Although it is difficult to measure, assess, and address the impacts of sea-level rise, this issue presents perhaps the greatest long-term threat to the coastal habitat and its species as it may completely alter the coastal landscape.

F. Priority Conservation Areas, Assessments, and Strategies within the Atlantic Coastal Landscape

1. Atlantic Coastal Cape May

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

The Atlantic Coastal Cape May Zone spans the eastern edge of the Cape May Peninsula, from Cape May to southern Ocean City (Figure 5). An extensive area of salt marsh and relatively small shallow bays, and tidal creeks and lagoons, extends from the uplands along the Garden State Parkway to the dunes and beaches of the narrow and heavily developed Atlantic Coast barrier islands (Wildwoods, Stone Harbor, Avalon, Sea Isle City, and Ocean City). Very few small creeks feed the area from the adjacent mainland uplands.

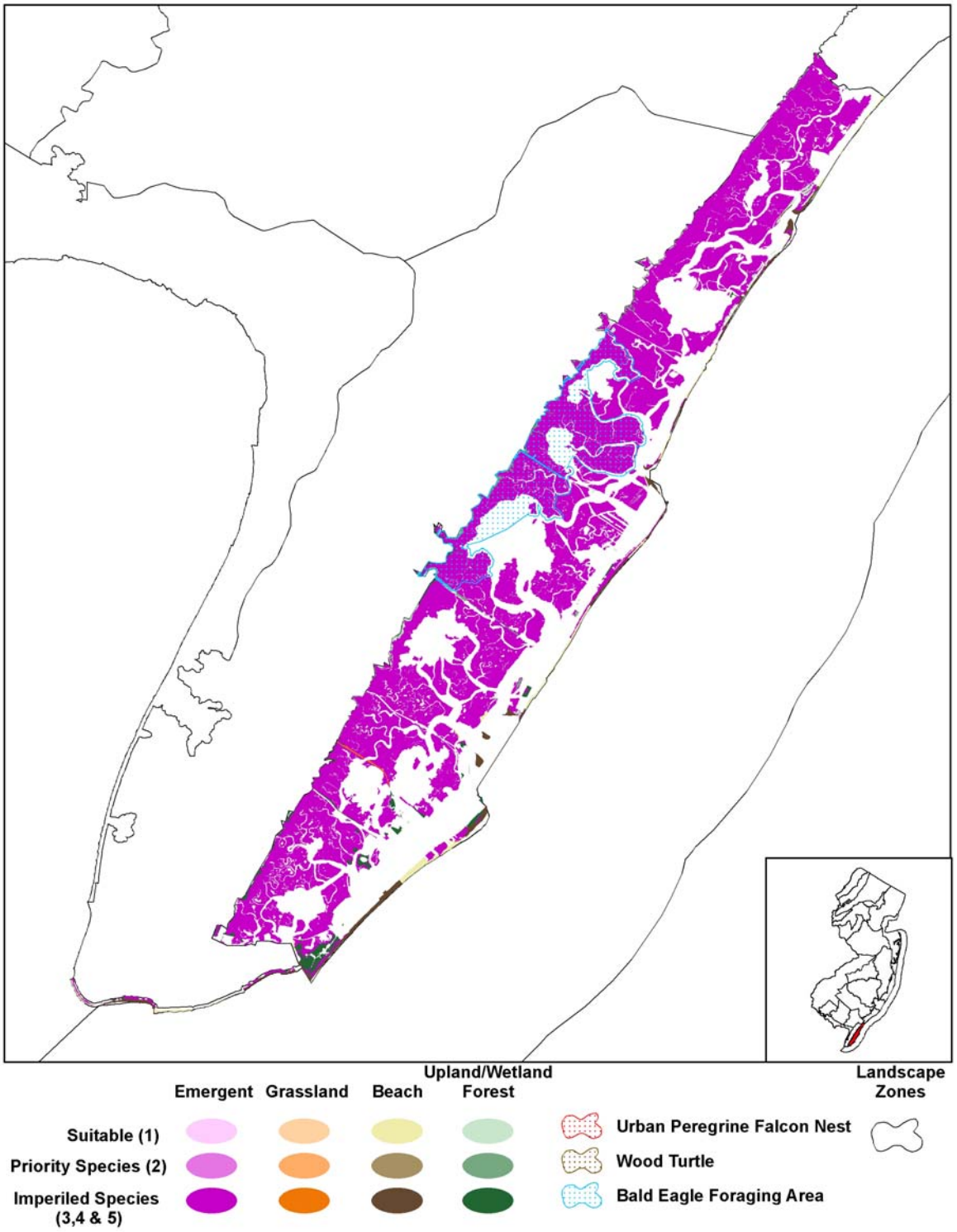
Conservation areas of opportunity in the Atlantic Coastal Cape May Zone include the beach and dunes of Cape May Point State Park, The Nature Conservancy's South Cape May Meadows Beach, the U.S. Coast Guard Training Center (TRACEN) beach, Two-Mile Beach (including the sections of the U.S. Coast Guard Loran Support Unit (LSU) and Cape May National Wildlife Refuge), Cape May Coastal Wetlands WMA, the ever-changing sandy islands and sandbars of Hereford Inlet, Stone Harbor Point (beach and adjacent undeveloped scrub-shrub), Strathmere Natural Area, and Corson's Inlet State Park. Several smaller municipal parks, including the Stone Harbor Bird Sanctuary and Armacost Park (Avalon) provide nesting habitat for colonial waterbirds and stopover habitat for migrating songbirds.

The beach/dune and coastal wetland/waterways habitats are the priority habitats in the coastal landscape region. Coastal wetlands and their associated waterways support the greatest diversity of species of conservation concern, whereas the beaches and dunes provide habitat for some of the state's most critically threatened species. These habitats are the most representative of the region and because of the intensive recreational usage within these habitats they should receive priority conservation status. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority within this region, although they still provide critical habitat for migratory birds, butterflies, and other species. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this region.

b. Wildlife of Greatest Conservation Need

The Atlantic Coastal Cape May region supports seven federal endangered or threatened species, eight state endangered species, five state threatened species, and 44 species of special concern or regional priority. The federal endangered or threatened species include piping plover, as well as sea turtle species that may enter the region's inlets and bays. In addition, summer or migratory populations of bats, including the federal endangered Indiana bat, are known to occur in the Atlantic Coastal Cape May Zone. American bittern, black skimmer, least tern, northern harrier,

Figure 5. Critical landscape habitats within the Atlantic Coastal Cape May conservation zone, as identified through the Landscape Map (v2).



peregrine falcon, sedge wren, short-eared owl, and Cope's gray treefrog are state endangered species. Black rail, black-crowned night-heron, osprey, red knot, and yellow-crowned night-heron species are state threatened. Special concern wildlife include the American oystercatcher, common tern, great blue heron, whimbrel, northern diamondback terrapin, and other coastal marsh birds, colonial waterbirds, migratory shorebirds, reptiles, and amphibians. Several game species, most notably selected waterfowl species, have been assigned priority status.

The narrow Cape May Peninsula concentrates birds as they migrate along the Atlantic Coast. The Cape May coastal beaches and dunes provide important habitats for nesting black skimmers, least terns, and piping plovers, and migrating shorebirds, including red knots and whimbrels.

The coastal marsh provides nesting and foraging habitat for American oystercatchers, bald eagles, common terns, ospreys, peregrine falcons, northern diamondback terrapins, and coastal marsh birds and colonial waterbirds. Back-bay salt marshes and coastal sounds in this area are critical wintering areas for Atlantic brant and American black ducks in the Atlantic Flyway. Other wintering and migratory waterfowl utilize coastal marshes and bays. Small freshwater wetlands immediately adjacent to coastal salt marshes provide habitat for Cope's gray treefrog. Patches of upland forest and scrub-shrub support nesting colonial waterbirds, eastern box turtles, forest-dwelling bats, Cope's gray treefrogs, and Fowler's toads. Marine mammals, sea turtles, and some species of anadromous fish utilize estuarine habitat, including inlets and bays. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Atlantic Coastal Cape May Zone

Table C9. Federal Endangered and Threatened Species*

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Birds				
Piping plover		X		
Reptiles				
Green sea turtle	X			
Hawksbill sea turtle	X			
Kemp's ridley sea turtle	X			
Leatherback sea turtle	X			
Loggerhead sea turtle	X			

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
X: Species occurs within the identified habitat.

Table C10. State Endangered Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American bittern			X	
Bald eagle			X	X
Black skimmer		X	X	
Least tern		X		
Northern harrier			X	X
Peregrine falcon			X	
Sedge wren			X	
Short-eared owl			X	X
Amphibians				
Cope's gray treefrog			X	

X: Species occurs within the identified habitat.

Table C11. State Threatened Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
Black rail			X	
Black-crowned night heron			X	X
Osprey		X	X	
Red knot		X	X	
Yellow-crowned night heron			X	X

X: Species occurs within the identified habitat.

Table C12. Nongame Species of Conservation Concern

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Harbor porpoise	X			
Harbor seal♦	X	X		
Marsh rice rat			X	
Southern bog lemming			X	X
Birds				
American golden-plover			X	
American oystercatcher		X	X	
Black tern		X		
Caspian tern		X		
Cattle egret			X	
Chimney swift				X
Common barn owl				X
Common tern		X	X	
Forster's tern			X	
Glossy ibis			X	
Great blue heron				X
Great crested flycatcher				X
Great egret			X	
Greater yellowlegs			X	
Green heron			X	X
Gull-billed tern		X	X	
Horned lark		X		
Hudsonian godwit			X	
King rail			X	
Least bittern			X	
Little blue heron			X	
Marbled godwit			X	
Marsh wren			X	
Nelson's sharp-tailed sparrow			X	
Purple sandpiper		X		
Royal tern		X		
Ruddy turnstone		X	X	
Saltmarsh sharp-tailed sparrow			X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds (continued)				
Sanderling		X	X	
Seaside sparrow			X	
Semipalmated sandpiper		X	X	
Snowy egret			X	
Tricolored heron			X	
Whimbrel			X	
Willet		X	X	
Wilson's phalarope		X	X	
Reptiles				
Eastern box turtle				X
Northern diamondback terrapin		X	X	
Amphibians				
Fowler's toad		X		
Fish				
Atlantic sturgeon	X			

♦Harbor seal primarily present in water, but utilize beach as "haul-outs".
X: Species occurs within the identified habitat.

Table C13. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American black duck	X		X	
Atlantic brant	X		X	
Black scoter	X			
Bufflehead	X		X	
Canada goose (Atlantic population)	X		X	
Canvasback	X		X	
Clapper rail			X	
Common eider *	X			
Greater scaup	X		X	
Harlequin duck*	X			
Lesser scaup	X		X	
Long-tailed duck	X			
Northern pintail	X		X	
Surf scoter	X			
Virginia rail			X	
White-winged scoter	X			

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
X: Species occurs within the identified habitat.

Table C14. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table C15. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
River otter	X		X	
Birds				
Sora rail			X	

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Habitat loss due to commercial and residential development has historically been one of the greatest threats to wildlife along the coast, including within the Atlantic Coastal Cape May Zone. Although a great deal of the buildable private land within this zone is now developed, critical habitat continues to be lost or altered due to development. Intensive dune management, including overuse of dune fencing and unnecessary beach grass planting (i.e. where adequate storm protection already exists), has reduced habitat quality for beach nesting birds and continues in some locations, such as Stone Harbor, Sea Isle City, Strathmere village, and Ocean City. Mechanical beach raking on virtually all municipal beaches (with the exception of Stone Harbor Point and Strathmere village) reduces available foraging habitat for piping plovers and migratory shorebirds and poses risks to unfledged piping plover and least tern chicks. Development of the little remaining coastal scrub-shrub and forested habitat reduces habitat critical for migratory songbirds, raptors, and butterflies. Invasive plant species, such as phragmites, which dominate many dredge disposal sites and some coastal salt marshes, reduce the suitability of habitat for critical coastal species, including breeding long-legged wading birds, marsh-nesting birds, and waterfowl. The impacts of aquaculture, particularly for hard clams (*Mercenaria mercenaria*) as well as hydraulic crab dredging, are largely unmeasured and poorly understood.

Threats due to human activity, many of which are related to intense recreational uses of the local beaches and waterways, are also major factors in this zone. Beach nourishment projects create otherwise suitable habitat in areas of high human use, increasing impacts of human disturbance on beach nesting birds. Intensive recreational use of virtually all beaches, with the exceptions of the U.S. Coast Guard – TRACEN and the Two-Mile Beach Unit of the Cape May National Wildlife Refuge, severely impacts nesting success for beach nesting birds and also creates disturbance to a wide range of migrating shorebirds. Lax enforcement of local "no-dogs-on-beach" ordinances on nearly all municipal and some state-owned beaches (e.g., Strathmere Natural Area) creates severe disturbance of beach nesting birds, with resultant impacts on nesting success. Boats and personal watercraft create disturbance at back-bay colonial waterbird colonies and osprey nests, especially those located closest to barrier islands, and interfere with foraging throughout the region.

Excessive predation, especially by human subsidized species (e.g., red fox, crow, gull species, raccoon, striped skunk, free-roaming "owned" or feral cats), severely impairs beach nesting bird and colonial waterbirds breeding success. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, enhance, and/or restore critical habitats identified by the Landscape Project, focusing primarily on habitat for beach dependent species such as piping plover, least tern, black skimmer, migratory shorebirds (e.g., red knots), and northeastern beach tiger beetle. The beach/dune habitat is one of two priority habitat types in this zone.
- Identify, protect, enhance, and/or restore suitable coastal wetlands and waterways for wildlife species of conservation concern such as waterfowl, colonial waterbirds (e.g., long-legged, wading birds), secretive marsh birds" (i.e. bitterns, rails), northern diamondback terrapin, and the harbor seal. The coastal wetland/waterways habitats are the second group of priority habitats in this zone.
- Identify, protect, enhance, and/or restore suitable forest and wetland forest habitat for wildlife species of conservation concern, particularly for raptors, forest-dwelling bats, and yellow- and black-crowned night herons. Forest/forested wetlands are of secondary importance and would receive the lowest priority within this zone.
- Identify, protect, enhance, and/or restore suitable scrub-shrub habitat (areas with >25% woody vegetation <15 feet in height, including late successional back dune vegetative communities, often characterized by presence of bayberry) for wildlife species of conservation concern, particularly migratory songbirds, raptors, butterflies, and other species. Coastal scrub-shrub, including some vegetated dune communities, is of secondary priority in this zone.
- Protect and enhance water quality to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Inventory, determine distribution, and monitor endangered, threatened, special concern, and regional priority wildlife and fish species in the Atlantic Coastal Cape May Zone.
- Prevent, stabilize, and reverse declines of endangered, threatened, and rare wildlife and special concern fishes.
- Continue to monitor and protect osprey and peregrine falcon.
- Protect beach nesting bird sites and associated foraging habitats from human disturbance, predation, and other threats.
- Reduce the impacts of human disturbance, predation, and other threats on colonial nesting birds.
- Assess large-scale habitat change (every five to 10 years) focusing on beach erosion and loss of coastal marshes and coastal bay islands.
- Protect and enhance important and unique natural communities.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

As of March 21, 2007, the Atlantic Coastal Regional Landscape stakeholders have not had the opportunity to conduct a prioritization exercise for the following actions. Actions below have been assigned identification numbers that can be cross-referenced between the Plan and the prioritization worksheet. Items below identified with the word "combine" have been compiled with one or more other similar actions within the worksheet but remain separate within the Plan for detail.

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical beach/dune, coastal scrub-shrub, forest, and wetland habitats and assess their condition for nesting, migrating, and wintering birds, and other coastal species. Take action to minimize habitat loss by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or habitat management plans. Maintain information and incorporate all new survey and mapping data into the Landscape Project and Biotics database. *(Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify areas where additional habitat-based regulatory measures or land acquisition would be appropriate to benefit wildlife species of conservation concern.
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Develop, implement, and evaluate best management practices to protect, enhance, and restore upland habitat to maintain the migration of raptor (with a main focus on osprey and peregrine falcon) and passerine populations (with a focus on scrub-shrub inhabitants) at viable levels. Develop an action plan for immediate implementation should habitat levels fall below the minimum necessary to sustain the migration. Actively manage state and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*

Priority	Conservation Actions (continued)
Protect critical beach habitat for wildlife species of conservation concern	
1º	Work with the U.S. Army Corps of Engineers (USACE) and the NJDEP Office of Construction and Engineering (OCE) to integrate designs into beach nourishment projects that increase availability of and access to nesting and foraging habitat for beach nesting birds. *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs), for dune management policies, to incorporate into beach nesting bird management agreements, through collaborative efforts with the U.S. Department of Agriculture (USDA) – Natural Resources Conservation Services (NRCS), U.S. Fish and Wildlife Service (USFWS), USACE, and NJDEP LURP. *(Other practices – land management; Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Investigate the efficacy of experimental techniques (e.g., restoration, enhancement) to improve foraging habitat for beach nesting birds. *(Conserve wildlife – rare wildlife)*
2º	Create and maintain additional nesting and foraging areas for the piping plover and other beach nesting bird species at Cape May NWR – Two Mile Beach Unit. Investigate if habitat restoration is appropriate at other beach nesting bird sites, including USCG – TRACEN and USCG – LSU. *(Conserve wildlife – rare wildlife)*
Protect critical coastal wetland habitat and waterways for wildlife species of conservation concern	
1º	Work with NJDEP-OCE, USACE, and other appropriate agencies to coordinate beneficial placement of dredge materials for creation, enhancement, or maintenance of colonial waterbird nesting, in particular with regards to Intercoastal Waterway restoration projects. *(Conserve wildlife – rare wildlife; Other practices – land management)*
1º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl.
2º	Develop, implement, and evaluate best management practices for making dredge spoil deposition sites attractive to breeding, migrating, and wintering wildlife. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Reestablish/restore historically important submerged aquatic vegetation beds to benefit waterfowl species. *(Conserve wildlife – game species)*
2º	Protect overwintering colonies and/or "haul out" areas for harbor seals by using GIS measures, other remote sensing tools, and surveys to identify important "haul-out" areas (e.g. Hereford Inlet) and post them to minimize human disturbance. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
2º	GIS, other remote sensing tools, and surveys to identify critical habitats supporting local bald eagle nesting, summering and wintering populations and assess their condition. Take action to minimize habitat loss and maintain contiguous habitats by restoring, enhancing, and/or protecting woodland and riverine habitats and waterways on public and private lands through direct purchase or easements. Enlist private landowners in preservation programs, where appropriate, to maintain suitable habitats free of human disturbance during key periods. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Protect habitat – Landscape Project)*
Protect critical forest and forested wetland habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining forest parcels; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect critical scrub-shrub habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining parcels of scrub-shrub habitat; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect and enhance water quality	
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. Seek appropriate classifications for stream segments based on Index of Biotic Integrity (IBI) results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
2º	Protect water quality through the enforcement of Clean Vessel Act regulations. Boaters to observe pump-out and no discharge zone designations. *(Protect habitat – rare wildlife, fish)*

Priority	Conservation Actions (continued)
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Enhance or restore habitats for colonial waterbirds through the elimination or reduction of phragmites from dredge material sites to allow for the natural succession of woody habitats to benefit nesting long-legged wading birds or the creation of sandy substrate for ground nesting colonial waterbirds at selected sites. Restoration efforts should focus on historic dredge material sites, so as to not further reduce the available locations for sediment deposit. If an active site is selected for restoration, efforts should be focused on areas that will not interfere with the sites' capacity to accept sediment. "Jump-start" natural vegetation (using nursery stock and seedlings) where appropriate. *(Conserve wildlife – rare wildlife, invasives)*
1º	Develop, implement, and evaluate best management practices to address adverse effects of invasive plant and wildlife species (e.g. phragmites, mute swan) and over-abundant native wildlife (e.g. resident Canada geese, greater snow geese) on the quality of coastal wetland habitat. *(Conserve wildlife – invasives; Other practices – land management)*
2º	Assess impacts of gull populations (laughing gull, greater black-back gull, herring gull) on the breeding success of beach nesting birds, colonial waterbirds, and other species to determine if integrated wildlife damage management of gulls is necessary. *(Conserve wildlife – subsidized predators)*
2º	Monitor encroachment of Japanese sedge in beach/dune habitat, assess impacts on habitat quality, implement control efforts (e.g., herbicide and physical removal of plants) where appropriate, and research additional control methods. *(Evaluate restoration – invasives)*
2º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the level of potential impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
2º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for species of conservation concern. *(Conserve wildlife – invasives)*
Inventory, determine distribution, and monitor wildlife and fish	
1º	Conduct surveys and review existing databases to better identify the migratory songbird species using coastal habitat and the distribution of the species. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*

Priority	Conservation Actions (continued)
1º	Conduct research to quantify the importance of shrub-scrub habitat for migratory songbirds. *(Protect habitat – migratory birds)*
1º	Conduct surveys to determine distribution, population, and habitat use of coastal marsh birds, in particular high marsh specialists, such as northern harriers, black rails, and salt marsh sharp-tailed sparrows. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Research population distribution of northern diamondback terrapin to determine critical areas for protection. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify key road-crossing areas of northern diamondback terrapin and work with appropriate government agencies to install turtle crossing signs and erect turtle barriers or provide safe passage, as appropriate, depending on the habitat and location. *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors - roads)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland and barrier island colonies of colonial waterbirds (not covered by aerial surveys), with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Continue the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring; Protect habitat – migratory birds; Conserve wildlife – game species)*
2º	Continue the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – game species)*
2º	Conduct baseline inventory of the marsh rice rat, southern bog lemming, and seals and develop long-term monitoring plans to determine each species' population trend . *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Investigate home ranges of wintering Atlantic brant in relation to carrying capacity of back-bay habitat for Atlantic brant. *(Conserve wildlife – game species)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans; Corridors – migratory birds)*

Priority	Conservation Actions (continued)
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap and band bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Assess significance of coastal region as an important travel corridor and concentration site for migratory tree-roosting bats through comparative surveys of their distribution through radio-telemetry, acoustical monitoring, mist-netting, and field searches during the migratory season. *(Protect habitat – Landscape Project)*
2º	Identify and research water quality parameters for various species' populations including but not limited to long-legged colonial waterbirds, osprey, bald eagle, northern diamondback terrapin, and other water-dependent coastal species. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
Prevent, stabilize, and reverse declines of wildlife and fish populations	
1º	Reduce deleterious effects of pesticides on coastal species and ecosystems by conducting investigations that assess the impacts of pesticides and biological controls on coastal species, in particular those species dependent on coastal marshes and wetlands. Evaluate and modify best management practices as appropriate. *(Other practices – land management)*
1º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
1º	Improve marsh management techniques to benefit critical wildlife species by conducting critical assessments of the effects of Open Marsh Water Management on wildlife species, in particular high marsh nesting birds and waterfowl. Evaluate and modify best management practices as appropriate. *(Conserve wildlife – rare wildlife, game species; Other practices – land management)*
1º	Develop, implement, and evaluate management actions to enhance populations of special concern and rare fish, and implement adaptive management strategies. *(Conserve wildlife – rare wildlife; Protect habitat - fish)*
1º	Conduct research to assess the potential impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations. Conduct studies and create models to identify migratory routes of and assess the potential impacts of wind turbines, tall buildings, radio towers and other "human-made" tall structures to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
2º	Enhance northern diamondback terrapin populations by closing the harvest season until sustainable population levels are reached. Determine if protective regulations are sufficient, in conjunction with naturally occurring survivorship rates, to reduce mortality in northern diamondback terrapin populations. *(Conserve wildlife – rare wildlife)*
2º	Determine compliance with current crab trap regulations (e.g. turtle excluder devices) and increase enforcement if necessary. *(Conserve wildlife – rare wildlife)*
2º	Increase research efforts on the northern diamondback terrapin, including studies focusing on reproductive success, the effects of predators on productivity and developing sustainable population goals. *(Conserve wildlife – rare wildlife)*
2º	Investigate impacts of aquaculture on waterfowl and other wildlife. Determine relative effects of locations and aquaculture techniques. If possible, develop management actions or aquaculture techniques to minimize impacts. *(Aquaculture – land management; Conserve wildlife – game species)*
2º	Determine carrying capacity of coastal salt marshes for wintering American black ducks and Atlantic brant to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
2º	Investigate crab dredging impacts on back-bay habitats and wildlife. Determine if any restrictions are necessary to protect wildlife or habitats. If needed, determine the nature of restrictions on dredging activities that will achieve protection. *(Protect habitat – humans)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
Monitor and protect osprey and peregrine falcon	
1º	Continue monitoring all known pairs of peregrine falcons, including assessment of productivity and threats. Track other regularly observed peregrine falcons to determine new nesting pairs/sites. *(Monitor wildlife – long-term monitoring; Conserve Wildlife – rare wildlife)*
1º	Continue monitoring osprey, including coast wide survey of population and nesting success on biannual basis, and annual assessment of reproductive success at targeted locations. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Maintain nesting opportunities through repair and replacement of existing man-made structures. Identify where additional nesting structures would be appropriate, such as the coastal meadows between Ocean City and Sea Isle. *(Conserve wildlife – rare wildlife)*
2º	Continue to monitor fish stocks, in particular menhaden, to determine the effects of reduced or changing prey base on the reproductive success of osprey. *(Monitor wildlife – long-term monitoring)*
Protect beach nesting bird sites and foraging habitats	
1º	Continue intensive monitoring of populations and reproductive success of beach nesting birds, including piping plover, least tern, black skimmer, common tern, and American oystercatcher, to determine population trends. *(Monitor wildlife – long-term monitoring; Conserve Wildlife – rare wildlife)*
1º	Continue surveys of wintering population of American oystercatcher to determine abundance, distribution, and population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Reduce excessive predation on beach nesting birds by working with local municipalities and other landowners to develop policies and/or establish regulations that minimize the impacts of predators (e.g., raccoons, gulls, red fox, feral and free-roaming cats) on beach nesting birds. *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce predation on beach nesting birds through current management techniques (i.e. predator exclosures, electric fence), and implementation of integrated wildlife damage management at important nesting sites for beach nesting birds. *(Conserve wildlife – cats, subsidized predators)*
1º	Continue existing management practices that minimize impacts of human disturbance (e.g., fence, post, and patrol nesting sites). Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
1º	Protect beach nesting birds and minimize impacts on their reproductive success by incorporating limits on beach raking practices into beach nesting bird management agreements. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
1º	Reduce and mitigate impacts of human activities on beach nesting birds through the development and implementation of beach management agreements with municipalities. Update existing agreements and continue to monitor and evaluate the success of the agreements and modify as appropriate. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
1º	Reduce the impacts of human disturbance on red knots and other migratory shorebirds that use the intertidal zone of beaches and inlets by posting and/or fencing critical migratory sites, and developing management plans or policies that minimize human impacts. *(Protect habitat – humans)*
2º	Research and monitor comparative reproductive success of American oystercatcher and common terns on beach- vs. marsh-nesting habitat at selected sites, including identification of specific threats. *(Conserve wildlife – rare wildlife)*
2º	Incorporate enforcement of pet restriction regulations into beach nesting bird plans and agreements. Strengthen law enforcement of no-pet restrictions (e.g., dog ordinances) by state and federal conservation officers and park rangers. *(Protect habitat – humans)*
2º	Increase regular presence of state conservation officers at beach nesting bird sites during the nesting season. *(Protect habitat – humans)*
Reduce negative impacts on colonial nesting birds	
1º	Increase frequency of coast-wide aerial colonial waterbirds' surveys to once every other year to better determine population trends and distribution. Continue critical investigation of aerial survey technique through selected "ground truthing" and literature and peer review in order to increase efficacy of survey, minimize surveyor bias and error, and increase accuracy of trend data. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Reduce excessive predation on colonial nesting birds through implementation of implementation of integrated wildlife damage management at important nesting sites for colonial nesting birds. *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce watercraft impacts on colonial waterbirds. Use GIS measures, other remote sensing tools, and surveys to identify important foraging areas and habitats and establish, post, and enforce buffers to restrict watercraft and pedestrian use around nesting areas. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
2º	Investigate habitat selection of breeding colonial waterbirds, including use of phragmites. *(Protect habitat – Landscape Project)*
2º	Determine reproductive success of colonial waterbirds at targeted nesting colonies. Identify factors limiting success (e.g., predators and possible effects of contaminants). *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife, contaminants)*
2º	Conduct investigations to establish appropriate buffer sizes to minimize disturbance from watercraft and pedestrians at colonial bird nesting sites. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion. Focus within this zone should be on beach erosion and loss of coastal marshes and coastal bay islands.
Protect and enhance important and unique habitats	
1º	Protect and restore critical habitats and their associated wildlife in Hereford Inlet , including at Stone Harbor Point, Champagne Island, and adjacent marsh islands and wetlands through the development of a comprehensive management plan(s), by investigating the feasibility of incorporating Champagne Island into Cape May Wetlands Wildlife Management Area (WMA) and/or through the creation of a state regulated marine conservation zone similar to the existing model used for Sedge Islands WMA. *(Protect habitat – Landscape Project; Protect habitat – migratory birds)*
2º	Monitor and maintain restored nesting and foraging areas (back dune ponds) created for piping plover and other beach nesting bird species at the South Cape May Meadows beach. *(Protect habitat – Landscape Project; Protect habitat – migratory birds)*
Promote public education and awareness and wildlife conservation	
1º	Create viewing opportunities for beach nesting birds at Cape May Point SP, Stone Harbor Point, Strathmere NA, and Corson's Inlet SP, and for colonial water birds at selected appropriate locations. Develop and install interpretive signage at wildlife viewing locations. Develop and install interpretive signage at wildlife viewing locations. *(Education – humans)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
1º	Develop and present educational programs to local environmental organizations, community groups, schools, and the general public to promote understanding of threats to beach nesting birds, colonial water birds, osprey, and for other coastal species as needed, and to increase environmental stewardship. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*

Priority	Conservation Actions (continued)
1º	Develop targeted outreach brochures for pet owners to reduce the negative impacts to beach nesters and migratory and breeding shorebirds from domestic dog activity and free-roaming cats. *(Education - humans)*
1º	Develop a brochure and/or poster which targets boat and jet-ski operators in order to help minimize their impact on wildlife. The outreach materials should include general information about what wildlife may be encountered, and the proper etiquette and appropriate practices for operating watercraft in the vicinity of wildlife and/or areas posted to protect wildlife. *(Education – humans)*
2º	Develop and encourage opportunities for eco-tourism in the coastal zone including but not limited to the creation of viewing opportunities, interpretive trails, and other wildlife viewing experiences. *(Education – humans)*
2º	Work with New Jersey Division of Parks and Forestry (NJDPF) to develop and enhance outreach opportunities with regards to beach nesting birds at state parks and natural areas, such as Cape May Point SP, Strathmere NA and Corson's Inlet SP. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Develop an outreach brochure about northern diamondback terrapin biology, behavior, and threats, specifically targeting recreational (crab pot) crabbers that can be distributed when they are applying for their crabbing licenses. *(Education – humans)*
2º	Provide public education and outreach efforts focused on NJ's Clean Marina Program and encourage marina owners, boaters, etc. to adopt voluntary practices aimed at preventing adverse impacts to water quality. *(Education – humans)*
2º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, backyard habitat management, and Citizen Science Program. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Work with private landowners to maintain or create scrub-shrub habitat for migratory songbirds, raptors and butterflies through promotion of "backyard habitat" program.
- Encourage private owners of dredge material islands to create or enhance habitat suitable for colonial nesting birds through landowner incentive programs.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.

Public

- Expand volunteer Citizen Scientist Program recruitment and activities.
  - Collaborate with conservation groups such as NJ Audubon Society, local land trusts, The Nature Conservancy–NJ Chapter, and NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to

locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
  - Recruit Citizen Scientists and conservation groups to assist with surveying and monitoring of wildlife, including colonial waterbirds, ospreys, peregrine falcons, and migratory shorebirds and songbirds.
  - Involve Citizen Scientists in management and protection projects, such as fencing beach nesting bird breeding sites, erection and placement of osprey nesting platforms, and other appropriate projects.

Wildlife Professionals

- Collaborate with researchers and wildlife managers from other Atlantic coast states to develop best management practices, conservation plans, and surveying protocol for colonial waterbirds, beach nesting birds, and other coastal species.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Foster collaboration with TNC to investigate feasibility of creation of alternate feeding habitat for piping plover at South Cape May Meadows Beach.
- Coordinate efforts to protect northern diamondback terrapin with The Wetlands Institute, especially in identifying areas of high road mortality and to insure that data collection addresses conservation needs.
- Elicit assistance from the New Jersey Audubon Society (NJAS), in particular through coordinated Citizen Scientist Program, to assist in various bird surveys.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds of conservation need.
- Work with conservation organization such as NJAS, American Bird Conservancy, and Cats Indoors! to develop advocacy for appropriate conservation and regulatory issues.
- Work with The Wetlands Institute to develop conservation or survey projects appropriate for summer interns and assist with appropriate outreach projects (e.g., beach walks).
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Encourage the use of Landscape Project critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres and local land trusts.

Academic Institutions

- Collaborate with Richard Stockton College's Coastal Research Center to develop comparisons of manipulated and natural beach systems that can be used to develop a scientific model to identify suitable beach nesting bird micro-habitats that can be incorporated into beach fill project designs.
- Work with Richard Stockton College to develop appropriate projects for internship program.
- Work with Rutgers University to develop appropriate graduate level research projects in the coastal area, in particular focusing on beach nesting birds and colonial waterbirds.

- Work with Rutgers University Center for Remote Sensing and Spatial Analysis to develop predictive modeling and GIS mapping of areas that will be potentially impacted by sea-level rise.
- Collaborate with other US and Canadian universities on migration and wintering ecology of waterfowl and other birds of conservation need.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, US Fish and Wildlife Service (USFWS) - NJ Field Office, US Army Corps. of Engineers (USACE), US Department of Agriculture (USDA), non-profit organizations, Department of Community Affairs (DCA), and Office of Smart Growth, to protect, enhance, and create habitats to protect populations of coastal species.
    - Municipalities, the New Jersey Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) and Parks and Forestry (DPF), USFWS, the State Wildlife Control Unit, US Department of Agriculture – Animal and Plant Health Inspection Service (USDA-APHIS) – Wildlife Services, and local animal control officers to work together to reduce effects of predators, especially red foxes and feral cats, on beach nesting birds and other critical wildlife.
    - Foster support from the Cape May County Shelter and other appropriate animal welfare groups or agencies to reduce predation of avian species, especially beach nesting birds, by feral and free-roaming domestic cats.
    - DFW and conservation organizations to develop stronger partnerships with municipal environmental commissions to gain support for local conservation efforts, in particular involving beachnesting birds.
    - DFW to create habitat and implement best management practices for coastal marsh birds and migratory songbirds and raptors on Wildlife Management Areas.
    - DFW to work with the USACE and state dredging programs to coordinate the beneficial use of dredge materials for the creation, enhancement, and maintenance of habitat for nesting colonial waterbirds and other wildlife.
    - DFW to coordinate development and implementation of beachnesting bird management plans with USFWS, DPF, USCG, and local municipalities.
    - DFW to work with the USFWS and the USACE, to ensure that beachfill and beach renourishment projects include a beach nesting bird component.
    - DFW, USFWS, USACE, NJ-OCE, DEP's Land Use Regulation Program (LURP), and USDA–Natural Resources Conservation Service (NRCS) to work together to develop dune management policies and techniques that benefit beach nesting birds, while still providing adequate storm protection.
    - Where feasible, continue to shift some responsibilities for management of beach nesting birds to individual municipalities and other agencies, as has already been achieved in the Borough of Avalon and with USCG-TRACEN.
    - DFW and conservation organizations to work with appropriate local, county, and state road departments to reduce road mortality to diamondback terrapins, in particular in areas identified as having high-density populations or high incidence of mortality.
    - DFW to continue protection measures for northern diamondback terrapin by requiring excluders on commercial crab traps in small creeks and lagoons.

  - DFW and local municipalities to limit public access to and disturbance of colonial waterbird breeding colonies and increase presence at beach nesting bird breeding sites.
  - DFW to work with state and county mosquito commissions to assess the impacts of insecticides and biological controls on critical wildlife, and improve best management practices for marsh management.
  - DFW and conservation organizations to work with Cape May NWR to coordinate conservation and management goals at the refuge's Two-Mile Beach Unit, and to develop protocol for inventory of wildlife present on refuge lands.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USFWS and other state, federal, and non-governmental partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration to plan for and assist with emergency oil spill response.
  - DFW and DPF to work with the USFWS and land stewards to develop effective plans to eradicate invasive, non-indigenous plants on federal, state, and privately preserved lands that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
  - DFW to work with LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, conservation organizations, and land stewards to work with NJ Coastal Heritage Trail to develop more wildlife focused trail destinations or viewing areas, and to elevate importance of eco-tourism.
  - DFW to work with NJDEP-OEC, USACE, and other appropriate agencies to develop and implement best management practices for making dredge spoil deposition sites attractive to breeding, migrating and wintering wildlife.
- DFW to lead in the development of educational materials for public and private landowners about wildlife of greatest conservation need, their habitats, the potential harmful effects of disturbance on beach nesting and coastal marsh birds, and the importance of the Atlantic Flyway and its associated migratory stopover sites.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and colonial waterbird and wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, local land trusts, and through mitigation.
- DEP to encourage the use of Landscape Project critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time.
- Monitor efficacy of habitat management, habitat restoration, and invasive species control projects.
- Continue to annually monitor abundance, productivity, distribution, and trends of breeding piping plovers, black skimmers, least terns, common terns, American oystercatchers (beach nesting population only), ospreys (biennial), peregrines, colonial waterbirds (biennial), as well as wintering waterfowl and migratory shorebird communities. Conduct threat assessment including factors relating to nest failure and brood loss.
- Collect baseline data (distribution and abundance) for other coastal species, such as marsh birds, migratory songbirds and raptors, diamondback terrapin, and coastal mammals including bats.
- Conduct Delphi Process every three to four years to update status of coastal species.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

2. Atlantic City Area

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

The Atlantic City Area spans the eastern edge of Atlantic County and the northernmost section of Cape May County (Figure 6). It encompasses all or part of several heavily developed barrier islands, including Absecon Island (urban Atlantic City, Ventnor, Margate and Longport), the highly developed portions of Ocean City to the south and the City of Brigantine to the north. The beaches are highly manipulated as a result of ongoing beach renourishment projects and municipal usage patterns, and (with the exception of the beach in the City of Brigantine) are largely characterized by the existence of a boardwalk or bulkhead at the back of the beach instead of a natural dune system. A large area of salt marsh and shallow bays, including portions of the Great Egg and Absecon Bays, and tidal creeks and lagoons, extend west from the western edge of the barrier islands.

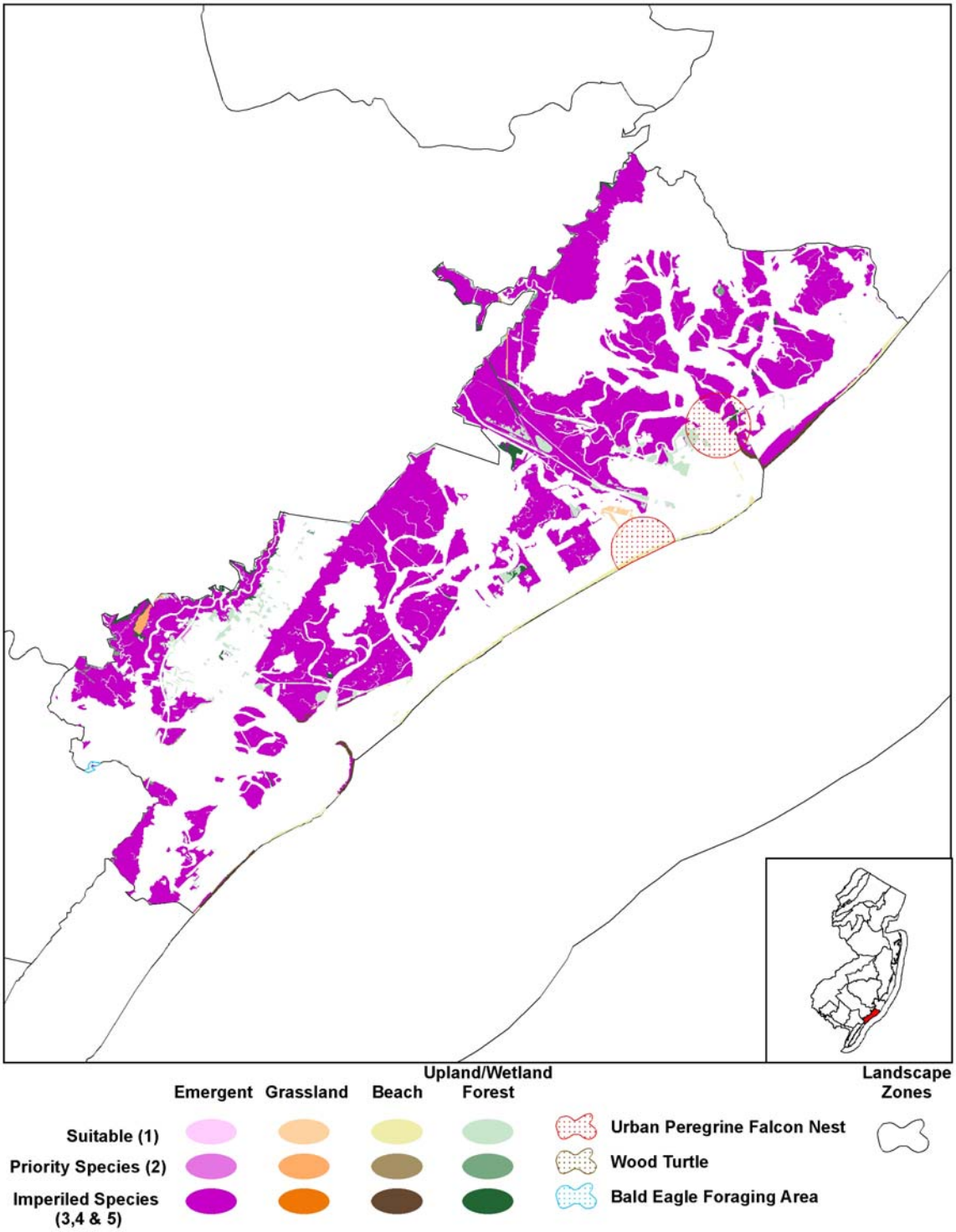
Despite the highly developed nature of this zone, some conservation areas of opportunity still exist, including Absecon WMA, Pork Island WMA, and Malibu Beach WMA. Small islands that dot the marshes behind the barrier islands, such as Cow Pen's Island, provide important nesting habitat for numerous species of long-legged colonial waterbirds. The Great Egg Harbor Bay and Inlet provide important estuarine habitat for waterfowl and marine species that may enter the bay. Portions of the Absecon Bay and its associated wetlands, most of which comprise the Absecon WMA, provide important wildlife habitat to a variety of species. These wetlands are especially important because they are contiguous with the extensive protected wetlands of the Edwin B. Forsythe National Wildlife Refuge (Brigantine Division). Beach and dune habitat that is suitable for wildlife is limited, and is not considered optimal due to the heavy recreational usage in this zone, although ongoing beach renourishment projects provide some beach nesting bird habitat.

The beach/dune and coastal wetland/waterways habitats are the priority habitats in the coastal landscape region. Coastal wetlands and their associated waterways support the greatest diversity of species of conservation concern, whereas the beaches and dunes provide habitat for some of the state's most critically threatened species. These habitats are the most representative of the region and because of the intensive recreational usage within these habitats they should receive priority conservation status. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority within this region, although they still provide critical habitat for migratory birds, butterflies, and other species. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this region.

b. Wildlife of Greatest Conservation Need

The Atlantic City zone supports eight federal endangered or threatened species, seven state endangered species, five state threatened species, and 44 species of special concern or regional

Figure 6. Critical landscape habitats within the Atlantic City Area conservation zone, as identified through the Landscape Map (v2).



priority. The federally endangered or threatened species include the piping plover, as well as sea turtle species that may enter the region's inlets and bays. In addition, summer or migratory populations of bats, potentially including the federal endangered Indiana bat, are suspected to occur in this zone. The bald eagle, American bittern, black skimmer, least tern, northern harrier, peregrine falcon, sedge wren and short-eared owl are state endangered. The black rail, black-crowned night-heron, osprey, red knot, and yellow-crowned night-heron are state threatened. Special concern wildlife include the American oystercatcher, common tern, great blue heron, whimbrel, northern diamondback terrapin, and other coastal marsh birds, colonial waterbirds, migratory shorebirds, reptiles, and amphibians. Back-bay salt marshes and coastal sounds in this area are critical wintering areas for Atlantic brant and American black ducks in the Atlantic Flyway. Other game species, most notably selected waterfowl species, have been assigned priority status.

Islands in the coastal marsh of this region support significant numbers of nesting long-legged colonial waterbirds, including state threatened black-crowned and yellow-crowned night herons. The coastal marsh also provides important nesting and foraging habitat for American oystercatchers, black skimmers, ospreys, peregrine falcons, and northern diamondback terrapins. Small freshwater wetlands and dune meadows immediately adjacent to coastal salt marshes provide habitat for Fowler's toads. Ledges on tall buildings and bridges in Atlantic City provide adaptive nesting habitat for peregrine falcons. Small numbers of beach nesting birds, including the federally listed piping plover and the state listed least tern and black skimmer nest on the beaches – primarily in Ocean City, where site fidelity remains strong despite heavy disturbance from recreation usage. Therefore, efforts to maximize beach nesting bird reproductive success should continue within this zone where birds nest. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Atlantic City Area Zone

Table C16. Federal Endangered and Threatened Species*

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Indiana bat**				X
Birds				
Piping plover		X		
Reptiles				
Green sea turtle	X			
Hawksbill sea turtle	X			
Kemp's ridley sea turtle	X			
Leatherback sea turtle	X			
Loggerhead sea turtle	X			

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
X: Species occurs within the identified habitat.

Table C17. State Endangered Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American bittern			X	
Bald eagle			X	X
Black skimmer		X	X	
Least tern		X		
Northern harrier			X	X
Peregrine falcon			X	
Sedge wren			X	
Short-eared owl			X	X

X: Species occurs within the identified habitat.

Table C18. State Threatened Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
Black rail			X	
Black-crowned night heron			X	X
Osprey		X	X	
Red knot		X	X	
Yellow-crowned night heron			X	X

X: Species occurs within the identified habitat.

Table C19. Nongame Species of Conservation Concern

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Harbor porpoise	X			
Harbor seal♦	X	X		
Marsh rice rat			X	
Southern bog lemming			X	X
Birds				
American golden-plover			X	
American oystercatcher		X	X	
Black tern		X		
Caspian tern		X		
Cattle egret			X	
Chimney swift				X
Common barn owl				X
Common tern		X	X	
Forster's tern			X	
Glossy ibis			X	
Great blue heron				X
Great crested flycatcher				X
Great egret			X	
Greater yellowlegs			X	
Green heron			X	X
Gull-billed tern		X	X	
Horned lark		X		
Hudsonian godwit			X	
King rail			X	
Least bittern			X	
Little blue heron			X	
Marbled godwit			X	
Marsh wren			X	
Nelson's sharp-tailed sparrow			X	
Purple sandpiper		X		
Royal tern		X		
Ruddy turnstone		X	X	
Saltmarsh sharp-tailed sparrow			X	
Sanderling		X	X	
Seaside sparrow			X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds (continued)				
Semipalmated sandpiper		X	X	
Snowy egret			X	
Tricolored heron			X	
Whimbrel			X	
Willet		X	X	
Wilson's phalarope		X	X	
Reptiles				
Eastern box turtle				X
Northern diamondback terrapin		X	X	
Amphibians				
Fowler's toad		X		
Fish				
Atlantic sturgeon	X			

♦Harbor seal primarily present in water, but utilize beach as "haul-outs".
X: Species occurs within the identified habitat.

Table C20. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American black duck	X		X	
Atlantic brant	X		X	
Black scoter	X			
Bufflehead	X		X	
Canada goose (Atlantic population)	X		X	
Canvasback	X		X	
Clapper rail			X	
Common eider *	X			
Greater scaup	X		X	
Harlequin duck*	X			
Lesser scaup	X		X	
Long-tailed duck	X			
Northern pintail	X		X	
Surf scoter	X			
Virginia rail			X	
White-winged scoter	X			

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
X: Species occurs within the identified habitat.

Table C21. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table C22. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJ DFW to be species of concern.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
River otter	X		X	
Birds				
Sora rail			X	

X: Species occurs within the identified habitat

c. Threats to the Wildlife and Habitats

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Lack of suitable beach habitat, due to excessive development of barrier islands and destruction of natural beach strand (boardwalks, bulkheading, other man-made features replacing the dune system), has severely limited opportunities for beach nesting birds. In those few areas where suitable beach habitat exists (e.g., portions of Ocean City and City of Brigantine), intensive dune and beach management, including overuse of dune fencing, sand mining, and mechanical beach raking, reduces available foraging habitat for piping plovers and migratory shorebirds and poses risks to unfledged piping plover and least tern chicks. Development of the little remaining coastal scrub-shrub and forested habitat reduces habitat critical for migratory raptors, songbirds and butterflies. Invasive plant species, such as phragmites, which dominate many dredge disposal sites and some coastal salt marshes, reduce the suitability of habitat for critical coastal species, including breeding long-legged wading birds, high marsh specialists, and waterfowl. The impacts of aquaculture, particularly for hard clams (*Mercenaria mercenaria*) as well as hydraulic crab dredging are largely unmeasured and poorly understood.

Beach nourishment projects create otherwise suitable habitat in areas of high human use (e.g., Ocean City), increasing impacts of human disturbance on beach nesting birds. Intensive recreational use of all beaches in this zone reduces the likelihood of nesting and severely impacts nesting success for beach nesting birds. In addition, it also creates disturbance to a wide range of migrating shorebirds. Lax enforcement of local "no-dogs-on-beach" ordinances (e.g., in Ocean City) results in severe disturbance of beach nesting birds, with resultant impacts on nesting success. Heavy vehicle usage (and related recreational activities) at the southern end of Brigantine Island creates impediments to beach nesting birds. Boats and personal watercraft create disturbance at back-bay colonial waterbird colonies and osprey nests, especially those located closest to barrier islands, and interfere with foraging throughout the region.

Excessive predation, especially by human-subsidized species (e.g., red fox, crow, gull species, raccoon, striped skunk, free-roaming "owned" or feral cats), severely impairs the breeding success of beach nesting birds and colonial waterbirds breeding success. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, enhance, and/or restore critical habitats identified by the Landscape Project, focusing primarily on habitat for beach dependent species such as piping plover, least tern, black skimmer, migratory shorebirds (e.g., red knots), and northeastern beach tiger beetle. The beach/dune habitat is one of two priority habitat types in this zone.
- Identify, protect, enhance, and/or restore suitable coastal wetlands and waterways for wildlife species of conservation concern such as waterfowl, colonial waterbirds (e.g., long-legged, wading birds), secretive marsh birds" (i.e. bitterns, rails), northern diamondback terrapin, and the harbor seal. The coastal wetland/waterways habitats are the second group of priority habitats in this zone.
- Identify, protect, enhance, and/or restore suitable forest and wetland forest habitat for wildlife species of conservation concern, particularly for raptors, forest-dwelling bats, and yellow- and black-crowned night herons. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this zone.
- Identify, protect, enhance, and/or restore suitable scrub-shrub habitat (areas with >25% woody vegetation <15 feet in height, including late successional back dune vegetative communities, often characterized by presence of bayberry) for wildlife species of conservation concern, particularly migratory songbirds, raptors, butterflies, and other species. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority in this zone.
- Protect and enhance water quality to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Inventory, determine distribution, and monitor endangered, threatened, special concern, and regional priority wildlife and fish species in the Atlantic City Area Zone.
- Prevent, stabilize, and reverse declines of endangered, threatened, and rare wildlife and special concern fishes.
- Continue to monitor and protect osprey and peregrine falcon.
- Protect beach nesting bird sites and associated foraging habitats from human disturbance, predation, and other threats.
- Reduce the impacts of human disturbance, predation, and other threats on colonial nesting birds.
- Assess large-scale habitat change (every five to 10 years) focusing on beach erosion and loss of coastal marshes and coastal bay islands.
- Protect and enhance important and unique natural communities.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Atlantic Coastal Regional Landscape stakeholders during a meeting held

on March 29, 2007 (see *Attachment H*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical beach/dune, coastal scrub-shrub, forest, and wetland habitats and assess their condition for nesting, migrating, and wintering birds, and other coastal species. Take action to minimize habitat loss by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or habitat management plans. Maintain information and incorporate all new survey and mapping data into the Landscape Project and Biotics database. *(Protect habitat – Landscape Project)*
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify areas where additional habitat-based regulatory measures or land acquisition would be appropriate to benefit wildlife species of conservation concern.
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Develop, implement, and evaluate best management practices to protect, enhance, and restore upland habitat to maintain the migration of raptor (with a main focus on osprey and peregrine falcon) and passerine populations (with a focus on scrub-shrub inhabitants) at viable levels. Develop an action plan for immediate implementation should habitat levels fall below the minimum necessary to sustain the migration. Actively manage state and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*
Protect critical beach habitat for wildlife species of conservation concern	
1º	Develop and implement beach management agreements with municipalities. Update existing agreements. Monitor and evaluate the success of the agreements and modify as appropriate. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Work with the U.S. Army Corps of Engineers (USACE) and the NJDEP Office of Construction and Engineering (OCE) to integrate designs into beach nourishment projects that increase availability of and access to nesting and foraging habitat for beach nesting birds. *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs) for dune management policies, to incorporate into beach nesting bird management agreements, through collaborative efforts with the U.S. Department of Agriculture (USDA) – Natural Resources Conservation Services (NRCS), U.S. Fish and Wildlife Service (USFWS), USACE, and NJDEP LURP. *(Other practices – land management; Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Investigate the efficacy of experimental techniques (e.g., restoration, enhancement) to improve foraging habitat for beach nesting birds. *(Conserve wildlife – rare wildlife)*
2º	Restore natural beach and dune profile at the southern end of Brigantine Island where beach management practices have drastically reduced suitability of breeding habitat for beach nesting birds. *(Conserve wildlife – rare wildlife; Other practices – land management)*
Protect critical coastal wetland habitat and waterways for wildlife species of conservation concern	
1º	Work with NJDEP-OCE, USACE, and other appropriate agencies to coordinate beneficial placement of dredge materials for creation, enhancement, or maintenance of colonial waterbird nesting, in particular with regards to Intercoastal Waterway restoration projects. *(Conserve wildlife – rare wildlife; Other practices – land management)*
1º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl. *(Conserve wildlife – rare wildlife, game species)*
2º	Develop, implement, and evaluate best management practices for making dredge spoil deposition sites attractive to breeding, migrating, and wintering wildlife. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Reestablish/restore historically important submerged aquatic vegetation beds to benefit waterfowl species. *(Conserve wildlife – game species)*
2º	Identify locations where undoing the effects of wetland ditching can benefit marsh species, especially high marsh or area-sensitive species, such as northern harriers. Implement restoration of these sites. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Protect overwintering colonies and/or "haul out" areas for harbor seals by using GIS measures, other remote sensing tools, and surveys to identify important "haul-out" areas (e.g. Great Egg Harbor Bay) and post them to minimize human disturbance. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
2º	Use GIS, other remote sensing tools, and surveys to identify critical habitats supporting local bald eagle nesting, summering and wintering populations and assess their condition. Take action to minimize habitat loss and maintain contiguous habitats by restoring, enhancing, and/or protecting woodland and riverine habitats and waterways on public and private lands through direct purchase or easements. Enlist private landowners in preservation programs, where appropriate, to maintain suitable habitats free of human disturbance during key periods. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Protect habitat – Landscape Project)*
Protect critical forest and forested wetland habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining forest parcels; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect critical scrub-shrub habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining parcels of scrub-shrub habitat; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect and enhance water quality	
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. Seek appropriate classifications for stream segments based on Index of Biotic Integrity (IBI) results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
2º	Protect water quality through the enforcement of Clean Vessel Act regulations. Boaters to observe pump-out and no discharge zone designations. *(Protect habitat – rare wildlife, fish)*

Priority	Conservation Actions (continued)
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Enhance or restore habitats for colonial waterbirds through the elimination or reduction of phragmites from dredge material sites to allow for the natural succession of woody habitats to benefit nesting long-legged wading birds or the creation of sandy substrate for ground nesting colonial waterbirds at selected sites. Restoration efforts should focus on historic dredge material sites, so as to not further reduce the available locations for sediment deposit. If an active site is selected for restoration, efforts should be focused on areas that will not interfere with the sites' capacity to accept sediment. "Jump-start" natural vegetation (using nursery stock and seedlings) where appropriate. *(Conserve wildlife – rare wildlife, invasives)*
1º	Develop, implement, and evaluate best management practices to address adverse effects of invasive plant and wildlife species (e.g. phragmites, mute swan) and over-abundant native wildlife (e.g. resident Canada geese, greater snow goose) on the quality of coastal wetland habitat. *(Conserve wildlife – invasives; Other practices – land management)*
2º	Assess impacts of gull populations (laughing gull, greater black-back gull, herring gull) on the breeding success of beach nesting birds, colonial waterbirds, and other species to determine if integrated wildlife damage management of gulls is necessary. *(Conserve wildlife –, subsidized predators)*
2º	Monitor encroachment of Japanese sedge in beach/dune habitat, assess impacts on habitat quality, implement control efforts (e.g., herbicide and physical removal of plants) where appropriate, and research additional control methods. *(Evaluate restoration – invasives)*
2º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the level of potential impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
2º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for species of conservation concern. *(Conserve wildlife – invasives)*
Inventory, determine distribution, and monitor wildlife and fish	
1º	Conduct surveys and review existing databases to better identify the migratory songbird species using coastal habitat and the distribution of the species. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*

Priority	Conservation Actions (continued)
1º	Conduct research to quantify the importance of shrub-scrub habitat for migratory songbirds. *(Protect habitat – migratory birds)*
1º	Conduct surveys to determine distribution, population, and habitat use of coastal marsh birds, in particular high marsh specialists, such as Northern harriers, black rails, and salt marsh sharp-tailed sparrows. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Research population distribution of northern diamondback terrapin to determine critical areas for protection. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify key road-crossing areas of northern diamondback terrapin and work with appropriate government agencies to install turtle crossing signs and erect turtle barriers or provide safe passage, as appropriate, depending on the habitat and location. *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors - roads)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland and barrier island colonies of colonial waterbirds (not covered by aerial surveys), with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Continue the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring; Protect habitat – migratory birds; Conserve wildlife – game species)*
2º	Continue the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – game species)*
2º	Conduct baseline inventory of the marsh rice rat, southern bog lemming, and seals and develop long-term monitoring plans to determine each species' population trend. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Investigate home ranges of wintering Atlantic brant in relation to carrying capacity of back-bay habitat for Atlantic brant. *(Conserve wildlife – game species)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans; Corridors – migratory birds)*

Priority	Conservation Actions (continued)
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap and band bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Assess significance of coastal region as an important travel corridor and concentration site for migratory tree-roosting bats through comparative surveys of their distribution through radio-telemetry, acoustical monitoring, mist-netting, and field searches during the migratory season. *(Protect habitat – Landscape Project)*
2º	Identify and research water quality parameters for various species' populations including but not limited to long-legged colonial waterbirds, osprey, bald eagle, northern diamondback terrapin, and other water-dependent coastal species. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
Prevent, stabilize, and reverse declines of wildlife and fish populations	
1º	Reduce deleterious effects of pesticides on coastal species and ecosystems by conducting investigations that assess the impacts of pesticides and biological controls on coastal species, in particular those species dependent on coastal marshes and wetlands. Evaluate and modify best management practices as appropriate. *(Other practices – land management)*
1º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, with a map of critical sites to implement stringent enforcement of endangered species laws, including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
1º	Improve marsh management techniques to benefit critical wildlife species by conducting critical assessments of the effects of Open Marsh Water Management on wildlife species, in particular high marsh nesting birds and waterfowl. Evaluate and modify best management practices as appropriate. *(Conserve wildlife – rare wildlife, game species; Other practices – land management)*
1º	Develop, implement, and evaluate management actions to enhance populations of special concern and rare fish, and implement adaptive management strategies. *(Conserve wildlife – rare wildlife; Protect habitat - fish)*
1º	Conduct research to assess the potential impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations. Conduct studies and create models to identify migratory routes of and assess the potential impacts of wind turbines, tall buildings, radio towers and other "human-made" tall structures to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
2º	Enhance northern diamondback terrapin populations by closing the harvest season until sustainable population levels are reached. Determine if protective regulations are sufficient, in conjunction with naturally occurring survivorship rates, to reduce mortality in northern diamondback terrapin populations. *(Conserve wildlife – rare wildlife)*
2º	Determine compliance with current crab trap regulations (e.g. turtle excluder devices) and increase enforcement if necessary. *(Conserve wildlife – rare wildlife*
2º	Increase research efforts on the northern diamondback terrapin, including studies focusing on reproductive success, the effects of predators on productivity and developing sustainable population goals. *(Conserve wildlife – rare wildlife)*
2º	Investigate impacts of aquaculture on waterfowl and other wildlife. Determine relative effects of locations and aquaculture techniques. If possible, develop management actions or aquaculture techniques to minimize impacts. *(Aquaculture – land management; Conserve wildlife – game species)*
2º	Determine carrying capacity of coastal salt marshes for wintering American black ducks and Atlantic brant to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
2º	Investigate crab dredging impacts on back-bay habitats and wildlife. Determine if any restrictions are necessary to protect wildlife or habitats. If needed, determine the nature of restrictions on dredging activities that will achieve protection. *(Protect habitat – humans)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
Monitor and protect osprey and peregrine falcon	
1º	Continue monitoring all known pairs of peregrine falcons, including assessment of productivity and threats. Track other regularly observed peregrine falcons to determine new nesting pairs/sites. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare species*
1º	Continue monitoring osprey, including coast-wide survey of population and nesting success on biannual basis, and annual assessment of reproductive success at targeted locations. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare species)*
1º	Maintain nesting opportunities through repair and replacement of existing man-made structures. Identify where additional nesting structures would be appropriate. *(Conserve wildlife – rare wildlife)*
2º	Continue to monitor fish stocks, in particular menhaden, to determine the effects of reduced or changing prey base on the reproductive success of osprey. *(Monitor wildlife – long-term monitoring)*
Protect beach nesting bird sites and foraging habitat	
1º	Continue intensive monitoring of populations and reproductive success of beach nesting birds, including piping plovers, least terns, black skimmers, common terns, and American oystercatchers, to determine population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare species)*
1º	Continue surveys of wintering population of American oystercatchers to determine abundance, distribution, and population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare species)*
1º	Continue existing management practices that minimize impacts of human disturbance (e.g., fence, post, and patrol nesting sites). Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
1º	Protect beach nesting birds and minimize impacts on their reproductive success by incorporating limits on beach raking practices into beach nesting bird management agreements. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
1º	Reduce the impacts of human disturbance on red knots and other migratory shorebirds that use the intertidal zone of beaches and inlets by posting and/or fencing critical migratory sites, and developing management plans or policies that minimize human impacts. *(Protect habitat – humans)*
1º	Reduce excessive predation on beach nesting birds by working with local municipalities and other landowners to develop policies and/or establish regulations that minimize the impacts of predators (e.g., raccoons, gulls, red fox, feral and free-roaming cats) on beach nesting birds. *(Conserve wildlife – cats, subsidized predators)*

Priority	Conservation Actions (continued)
1º	Reduce predation on beach nesting birds through current management techniques (i.e. predator exclosures, electric fence), and implementation of integrated wildlife damage management at important nesting sites for beach nesting birds. *(Conserve wildlife – cats, subsidized predators, humans)*
2º	Incorporate enforcement of pet restriction regulations into beach nesting bird plans and agreements. Strengthen law enforcement of no pet restrictions (e.g., dog ordinances) by state and federal conservation officers and park rangers. *(Protect habitat – humans)*
2º	Increase regular presence of state conservation officers at beach nesting bird sites during the nesting season. *(Protect habitat – humans)*
Reduce negative impacts on colonial nesting birds	
1º	Increase frequency of coast-wide aerial colonial waterbirds surveys to once every other year to better determine population trends and distribution. Continue critical investigation of aerial survey technique through selected "ground truthing" and literature and peer review in order to increase efficacy of survey, minimize surveyor bias and error, and increase accuracy of trend data**.** *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare species)*
1º	Reduce excessive predation on colonial nesting birds through implementation of integrated wildlife damage management at important nesting sites for colonial waterbirds. *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce watercraft impacts on colonial waterbirds. Use GIS measures, other remote sensing tools, and surveys to identify important foraging areas and habitats and establish, post, and enforce buffers to restrict watercraft and pedestrian use around nesting areas. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
2º	Investigate habitat selection of breeding colonial waterbirds, including use of phragmites. *(Conserve wildlife – rare wildlife)*
2º	Determine reproductive success of colonial waterbirds at targeted nesting colonies. Identify factors limiting success (e.g., predators and possible effects of contaminants). *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife, contaminants)*
2º	Conduct investigations to establish appropriate buffer sizes to minimize disturbance from watercraft and pedestrians at colonial bird nesting sites. *(Protect habitat – humans)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion. Focus within this zone should be on beach erosion and loss of coastal marshes and coastal bay islands.

Priority	Conservation Actions (continued)
Protect and enhance important and unique habitats	
2º	Determine species of priority for Malibu Beach WMA to help guide habitat restoration or management. *(Conserve wildlife – rare wildlife)*
Promote public education and awareness	
1º	Create viewing opportunities for colonial water birds at selected appropriate locations, such as the Ocean City Visitor's Center, and bayside street ends in Ventnor/Margate and Brigantine. Develop and install interpretive signage at wildlife viewing locations. Develop and install interpretive signage at wildlife viewing locations. *(Education – humans)*
1º	Develop and present educational programs to local environmental organizations, community groups, schools, and the general public to promote understanding of threats to beach nesting birds, colonial water birds, osprey, and for other coastal species as needed, and to increase environmental stewardship. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*
1º	Develop targeted outreach brochures for pet owners (Ocean City, City of Brigantine) to reduce negative impacts to beach nesters and migratory and breeding shorebirds from domestic dog activity and free-roaming cats. *(Education – humans)*
1º	Develop a brochure and/or poster which targets boat and jet-ski operators in order to help minimize their impact on wildlife. The outreach materials should include general information about what wildlife may be encountered, and the proper etiquette and appropriate practices for operating watercraft in the vicinity of wildlife and/or areas posted to protect wildlife. *(Education – humans)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop and encourage opportunities for eco-tourism in the coastal zone including but not limited to the creation of viewing opportunities, interpretive trails, and other wildlife viewing experiences. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Develop an outreach brochure about northern diamondback terrapin biology, behavior, and threats, specifically targeting recreational (crab pot) crabbers that can be distributed when they are applying for their crabbing licenses. *(Education – humans)*

Priority	Conservation Actions (continued)
2º	Provide public education and outreach efforts focused on NJ's Clean Marina Program and encourage marina owners, boaters, etc. to adopt voluntary practices aimed at preventing adverse impacts to water quality. *(Education – humans)*
2º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, backyard habitat management, and Citizen Science Program. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Work with private landowners to maintain or create scrub-shrub habitat for migratory songbirds, raptors and butterflies through promotion of "backyard habitat" program.
- Encourage private owners of dredge material islands to create or enhance habitat suitable for colonial nesting birds through landowner incentive programs.
- Continue to work with casino properties to help manage and monitor peregrine falcons that nest on casino tower ledges.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.

Public

- Expand volunteer Citizen Scientist Program recruitment and activities.
  - Collaborate with conservation groups such as NJ Audubon Society, local land trusts, The Nature Conservancy – NJ Chapter, and NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
  - Recruit Citizen Scientists and conservation groups to assist with surveying and monitoring of wildlife, including colonial waterbirds, ospreys, peregrine falcons, and migratory shorebirds and songbirds.
  - Involve Citizen Scientists in management and protection projects, such as fencing beach nesting bird breeding sites, erection and placement of osprey nesting platforms, and other appropriate projects.

Wildlife Professionals

- Collaborate with researchers and wildlife managers from other Atlantic coast states to develop best management practices, conservation plans, and surveying protocol for colonial waterbirds, beach nesting birds, and other coastal species.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Coordinate efforts to protect diamondback terrapin with The Wetlands Institute, especially in identifying areas of high road mortality and to insure that data collection addresses conservation needs.
- Elicit assistance from New Jersey Audubon Society, in particular through coordinated Citizen Scientist Program, to assist in various bird surveys.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds of conservation need.
- Work with conservation organization such as New Jersey Audubon Society, Atlantic County Audubon Society, American Bird Conservancy, Cats Indoors!, and Great Egg Harbor Watershed Association to develop advocacy for appropriate conservation and regulatory issues.
- Encourage the use of Landscape Project critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres and local land trusts.

Academic Institutions

- Collaborate with Richard Stockton College's Coastal Research Center to develop comparisons of manipulated and natural beach systems that can be used to develop a scientific model to identify suitable beach nesting bird micro-habitats, which can be incorporated into beach fill project designs.
- Work with Richard Stockton College to develop appropriate projects for internship program.
- Work with Rutgers University to develop appropriate graduate level research projects in the coastal area, in particular focusing on beach nesting birds and colonial waterbirds.
- Work with Rutgers University Center for Remote Sensing and Spatial Analysis to develop predictive modeling and GIS mapping of areas that will be potentially impacted by sea-level rise.
- Collaborate with other US and Canadian universities on migration and wintering ecology of waterfowl and other birds of conservation need.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USFWS - NJ Field Office, US Army Corps. of Engineers (USACE), USDA, non-profit organizations, Department of Community Affairs (DCA), and Office of Smart Growth to protect, enhance, and create habitats, and to protect populations of coastal species.
    - Municipalities, NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) and Parks and Forestry (DPF), the State Wildlife Control Unit, USDA-APHIS-Wildlife Services, and local animal control officers to work together to reduce the effects of predators, especially red foxes, on beach nesting birds and other critical wildlife.
    - Foster support from the Cape May and Atlantic County Shelters, Ocean City Humane Society and other appropriate animal welfare groups or agencies to reduce predation of avian species, especially beach nesting birds, by feral and free-roaming domestic cats.

- DFW and conservation organizations to develop stronger partnerships with municipal environmental commissions to gain support for local conservation efforts, in particular involving beach nesting birds.
- DFW to create habitat and implement best management practices for coastal marsh birds and migratory songbirds and raptors on state lands.
- DFW to work with the USACE and state dredging programs to create and maintain habitat for nesting colonial waterbirds.
- DFW to coordinate development and implementation of beach nesting bird management plans with USFWS, DPF and local municipalities.
- DFW to work with the USFWS and the USACE, to ensure that beach fill and beach renourishment projects include a beach nesting bird component.
- DFW, USFWS, USACE, NJ-OCE, DEP Land Use Regulation Program (LURP), and USDA – Natural Resources Conservation Service (NRCS) to work together to develop dune management policies and techniques that benefit beach nesting birds, while still providing adequate storm protection.
- Where feasible, continue to shift some responsibilities for management of beach nesting birds to individual municipalities.
- DFW and conservation organizations to work with appropriate local, county, and state road departments to reduce road mortality to northern diamondback terrapins, in particular in areas identified as having high-density populations or high incidence of mortality.
- DFW to continue protection measures for northern diamondback terrapin by requiring excluders on commercial crab traps in small creeks and lagoons.
- DFW and local municipalities to limit public access and disturbance to colonial waterbird breeding colonies and increase presence at beach nesting bird breeding sites.
- DFW to work with state and county mosquito commissions to assess the impacts of insecticides and biological controls on critical wildlife, and improve best management practices for marsh management.
- DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration, to plan for and assist with emergency oil spill response.
- DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive, non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
- DFW to work with USDA through the Natural Resource Conservation Service (NRCS) and the Wildlife Habitat Incentive Program (WHIP) to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
- DFW and DEP's Bureau Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.

  - DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
  - DFW to work with the DEP's Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, conservation organizations, and land stewards to work with NJ Coastal Heritage Trail to develop more wildlife focused trail destinations or viewing areas, and to elevate the importance of eco-tourism.
  - DFW to work with NJDEP-OEC, USACE, and other appropriate agencies to develop and implement best management practices for making dredge spoil deposition sites attractive to breeding, migrating and wintering wildlife.
- DFW to lead in the development of educational material for public and private landowners about wildlife of greatest conservation need, their habitats, the potential harmful effects of disturbance on beach nesting and coastal marsh birds, and the importance of the Atlantic Flyway and its associated migratory stopover sites.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and colonial waterbird viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, local land trusts, and through mitigation.
- DEP to encourage the use of Landscape Project critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time.
- Monitor efficacy of habitat management, habitat restoration, and invasive species control projects.
- Continue to annually monitor abundance, productivity, distribution, and trends of breeding piping plovers, black skimmers, least terns, common terns, American oystercatchers (beach nesting population only), ospreys (biennial), peregrine falcons, colonial waterbirds (biennial), as well as wintering waterfowl and migratory shorebird communities. Conduct threat assessment including factors relating to nest failure and brood loss.
- Collect baseline data (distribution and abundance) for other coastal species, such as marsh birds, migratory songbirds and raptors, diamondback terrapins, and coastal mammals including bats.
- Conduct Delphi Process every three to four years to update status of coastal species.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

3. Brigantine - Great Bay

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

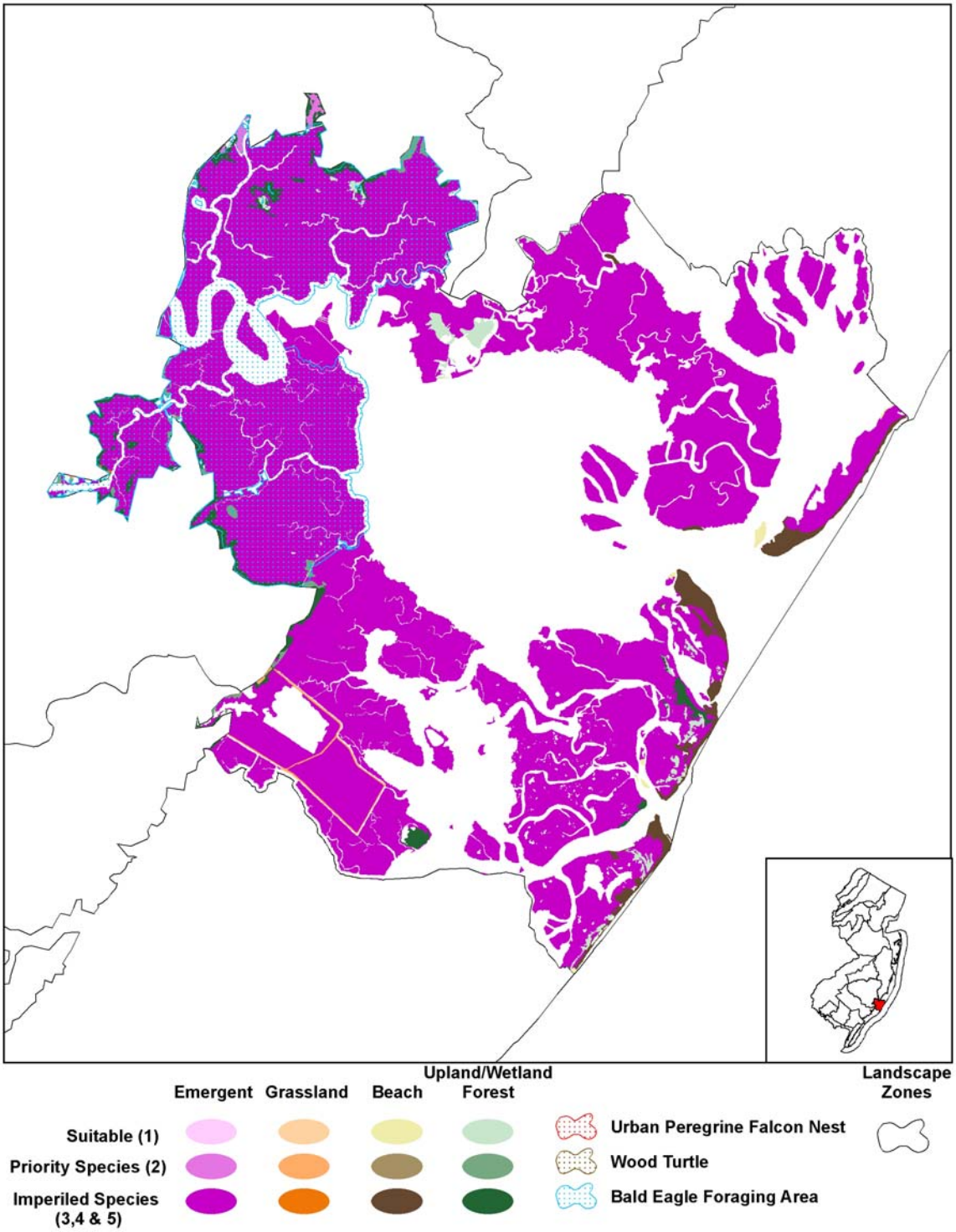
The Atlantic City skyline can be seen across salt meadows that extend south of Long Beach Island to the north of the Brigantine and Great Bay Conservation Priority Area (Figure 7). Squeezed between two heavily developed barrier islands, Absecon Wildlife Management Area (WMA), North Brigantine Natural Area, Edwin B. Forsythe National Wildlife Refuge (NWR), and Great Bay Boulevard WMA are important conservation opportunity areas that preserve the New Jersey coastal habitat, including barrier island beaches and dunes, inlets, tidal salt meadows, marshes, shallow coves, bays, and pristine maritime dune forest and scrub-shrub communities. This entire zone encompasses the only remaining large coastal area in the state that is largely untouched by development or other human alteration, and the Mullica River/Great Bay Watershed is one of the most pristine in the state. Therefore, this zone is one of the most critical for wildlife within the coastal region and state.

The beach/dune and coastal wetland/waterways habitats are the priority habitats in the coastal landscape region. Coastal wetlands and their associated waterways support the greatest diversity of species of conservation concern, whereas the beaches and dunes provide habitat for some of the state's most critically threatened species. These habitats are the most representative of the region and because of the intensive recreational usage within these habitats they should receive priority conservation status. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority within this region, although they still provide critical habitat for migratory birds, butterflies, and other species. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this region.

b. Wildlife of Greatest Conservation Need

The Brigantine – Great Bay zone supports eight federal endangered or threatened species, ten state endangered species, five state threatened species, and 44 species of special concern or regional priority. The federal or endangered species are the piping plover, and northeastern beach tiger beetle (reintroduction candidate), as well as sea turtle species that may enter the region’s inlets and bays. In addition, summer populations of bats, potentially including the federal endangered Indiana bat, are suspected to occur in the zone. The bald eagle, American bittern, black skimmer, least tern, northern harrier, peregrine falcon, pied-billed grebe, sedge wren, short-eared owl, and Cope’s gray treefrog are state endangered. The black rail, black-crowned night-heron, osprey, red knot, and yellow-crowned night-heron are state threatened. Special concern wildlife include the American oystercatcher, common tern, Forster’s tern, whimbrel, northern diamondback terrapin, and other coastal marsh birds, colonial waterbirds, migratory shorebirds, reptiles, and amphibians. Back-bay salt marshes and coastal sounds in this area are critical wintering areas for Atlantic brant and American black ducks in the Atlantic Flyway. Other game species, most notably selected waterfowl species, have been assigned priority status.

Figure 7. Critical landscape habitats within the Brigantine - Great Bay conservation zone, as identified through the Landscape Map (v2).


Emergent
Grassland
Beach
Upland/Wetland Forest
Landscape Zones
Suitable (1)
Priority Species (2)
Imperiled Species (3,4 & 5)
Urban Peregrine Falcon Nest
Wood Turtle
Bald Eagle Foraging Area

Along the Atlantic Flyway, the Brigantine - Great Bay area is an important stopover for migrating colonial waterbirds, waterfowl, shorebirds, songbirds and raptors, and provides significant wintering habitat for a variety of waterfowl species. Undeveloped barrier beaches provide critical nesting habitat for the black skimmer, least tern, black ducks, and piping plover, and other beach nesting species. Bald eagles, ospreys, peregrine falcons, and coastal marsh birds nest and forage in the vast salt meadows. Northern diamondback terrapin can also be found in the salt meadows and tidal bays and creeks; and beaches in this zone, where no bulkhead or other impediments exist, provide them with extensive nesting habitat. Marine mammals, sea turtles, and some species of anadromous fish utilize estuarine habitat, including inlets and bays. Harbor seals also use sandy beaches and sand bars within Great Bay as winter "haul-out" locations. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Brigantine – Great Bay Zone

Table C23. Federal Endangered and Threatened Species*

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Birds				
Piping plover		X		
Reptiles				
Green sea turtle	X			
Hawksbill sea turtle	X			
Kemp's ridley sea turtle	X			
Leatherback sea turtle	X			
Loggerhead sea turtle	X			
Insects				
Northeastern beach tiger beetle		R		

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table C24. State Endangered Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American bittern			X	
Bald eagle			X	X
Black skimmer		X	X	
Least tern		X		
Northern harrier			X	X
Peregrine falcon			X	
Sedge wren			X	
Short-eared owl			X	X
Amphibians				
Cope's gray treefrog			X	

X: Species occurs within the identified habitat.

Table C25. State Threatened Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
Black rail			X	
Black-crowned night heron			X	X
Osprey		X	X	
Red knot		X	X	
Yellow-crowned night heron			X	X

X: Species occurs within the identified habitat.

Table C26. Nongame Species of Conservation Concern

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Harbor porpoise	X			
Harbor seal♦	X	X		
Marsh rice rat			X	
Southern bog lemming			X	X
American golden-plover			X	
American oystercatcher		X	X	
Black tern		X		
Caspian tern		X		
Cattle egret			X	
Chimney swift				X
Common barn owl				X
Common tern		X	X	
Forster's tern			X	
Glossy ibis			X	
Great blue heron				X
Great crested flycatcher				X
Great egret			X	
Greater yellowlegs			X	
Green heron			X	X
Gull-billed tern		X	X	
Horned lark		X		
Hudsonian godwit			X	
King rail			X	
Least bittern			X	
Little blue heron			X	
Marbled godwit			X	
Marsh wren			X	
Nelson's sharp-tailed sparrow			X	
Purple sandpiper		X		
Royal tern		X		
Ruddy turnstone		X	X	
Saltmarsh sharp-tailed sparrow			X	
Sanderling		X	X	
Seaside sparrow			X	
Semipalmated sandpiper		X	X	
Snowy egret			X	
Tricolored heron			X	
Whimbrel			X	
Willet		X	X	
Wilson's phalarope		X	X	
Reptiles				
Eastern box turtle				X
Northern diamondback terrapin		X	X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Amphibians				
Fowler's toad		X		
Fish				
Atlantic sturgeon	X			

♦Harbor seal primarily present in water, but utilize beach as "haul-outs".
X: Species occurs within the identified habitat.

Table C27. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American black duck	X		X	
Atlantic brant	X		X	
Black scoter	X			
Bufflehead	X		X	
Canada goose (Atlantic population)	X		X	
Canvasback	X		X	
Clapper rail			X	
Common eider *	X			
Greater scaup	X		X	
Harlequin duck*	X			
Lesser scaup	X		X	
Long-tailed duck	X			
Northern pintail	X		X	
Surf scoter	X			
Virginia rail			X	
White-winged scoter	X			

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
X: Species occurs within the identified habitat.

Table C28. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table C29. Game Species.
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
River otter	X		X	
Birds				
Sora rail			X	

X: Species occurs within the identified habitat

c. Threats to the Wildlife and Habitats

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The Brigantine-Great Bay zone is the least impacted by habitat loss and habitat manipulation because much of the barrier island beach strand and coastal marsh is undeveloped, federally or state protected land. Furthermore, none of the beaches within the zone are part of beach replenishment projects. However, upland portions of the zone on the western edge of the back-bay, including scrub-shrub and forested habitat critical for migratory raptors, songbirds, and butterflies, continue to be under heavy pressure from residential and commercial development. Other habitat concerns include phragmites' intrusion or domination of salt marsh habitat and dredge disposal sites, which reduces the suitability of habitat for a variety of breeding or wintering species, including long-legged wading birds, marsh birds, and waterfowl. The impacts of aquaculture, particularly for hard clams (*Mercenaria mercenaria*) as well as hydraulic crab dredging, are largely unmeasured and poorly understood.

Boats and personal watercraft create disturbance at back-bay colonial waterbird colonies, osprey nests, and interfere with foraging throughout the region. Harbor seal "haul-out" areas in this zone are also subject to boat and personal watercraft disturbance.

Excessive predation by human subsidized species (e.g., red fox, crow, gull species, raccoon, striped skunk, free roaming "owned or feral cats), even in areas separated from residential development, severely impairs beach nesting bird and colonial waterbirds breeding success. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Enhance and/or restore critical beach and dune habitats identified by the Landscape Project for species such as piping plover, least tern, black skimmer, and migratory shorebirds (e.g., red knots). The beach/dune habitat is one of two priority habitat types in this zone.
- Identify, protect, enhance, and/or restore suitable coastal wetlands and waterways for wildlife species of conservation concern such as waterfowl, colonial waterbirds (e.g., long-legged, wading birds), secretive marsh birds" (i.e. bitterns, rails), northern diamondback terrapin, and the harbor seal. The coastal wetland/waterways habitats are the second group of priority habitats in this zone.
- Identify, protect, enhance, and/or restore suitable forest and wetland forest habitat for wildlife species of conservation concern, particularly for raptors, forest-dwelling bats, and yellow- and black-crowned night herons. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this zone.
- Identify, protect, enhance, and/or restore suitable scrub-shrub habitat (areas with >25% woody vegetation <15 feet in height, including late successional back dune vegetative communities, often characterized by presence of bayberry) for wildlife species of

conservation concern, particularly migratory songbirds, raptors, butterflies, and other species. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority in this zone.

- Protect and enhance water quality to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Inventory, determine distribution, and monitor endangered, threatened, special concern, and regional priority wildlife and fish species in the Brigantine - Great Bay Zone.
- Prevent, stabilize and reverse declines of endangered, threatened, and rare species and special concern fishes.
- Continue to monitor and protect osprey and peregrine falcons.
- Protect beach nesting bird sites and associated foraging habitats from human disturbance, predation, and other threats.
- Reduce the impacts of human disturbance, predation, and other threats on colonial nesting birds.
- Assess large-scale habitat change (every five to 10 years) focusing on beach erosion and loss of coastal marshes and coastal bay islands.
- Protect and enhance important and unique natural communities.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Atlantic Coastal Regional Landscape stakeholders during a meeting held on March 29, 2007 (see *Attachment H*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1°	Use GIS measures, other remote sensing tools, and surveys to identify critical beach/dune, coastal scrub-shrub, forest, and wetland habitats and assess their condition for nesting, migrating, and wintering birds, and other coastal species. Take action to minimize habitat loss by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or habitat management plans. Maintain information and incorporate all new survey and mapping data into the Landscape Project and Biotics database. *(Protect habitat – Landscape Project)*
1°	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify areas where additional habitat-based regulatory measures or land acquisition would be appropriate to benefit wildlife species of conservation concern.
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project; migratory birds)*
2º	Develop, implement, and evaluate best management practices to protect, enhance, and restore upland habitat to maintain the migration of raptor (with a main focus on osprey and peregrine falcon) and passerine populations (with a focus on scrub-shrub inhabitants) at viable levels. Develop an action plan for immediate implementation should habitat levels fall below the minimum necessary to sustain the migration. Actively manage state and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*
Enhance and/or restore critical beach habitat for wildlife species of conservation concern	
1º	Work with federal and state agencies to enhance and/or restore critical beach and dune habitats for beach nesting birds of conservation concern.
Protect critical coastal wetland habitat and waterways for wildlife species of conservation concern	
1º	Work with NJDEP-OCE, USACE, and other appropriate agencies to coordinate beneficial placement of dredge materials for creation, enhancement, or maintenance of colonial waterbird nesting, in particular with regards to Intercoastal Waterway restoration projects. *(Conserve wildlife – rare wildlife; Other practices – land management)*
1º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl. *(Conserve wildlife – rare wildlife; game species)*
2º	Develop, implement, and evaluate best management practices for making dredge spoil deposition sites attractive to breeding, migrating, and wintering wildlife. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Reestablish/restore historically important submerged aquatic vegetation beds to benefit waterfowl species. *(Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
2º	Identify locations where undoing the effects of wetland ditching can benefit marsh species, especially high marsh or area-sensitive species, such as northern harriers. Implement restoration of these sites. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Protect overwintering colonies and/or "haul out" areas for harbor seals by using GIS measures, other remote sensing tools, and surveys to identify important "haul-out" areas (e.g. Great Bay) and post them to minimize human disturbance. *(Protect habitat – humans)*
2º	Use GIS, other remote sensing tools, and surveys to identify critical habitats supporting local bald eagle nesting, summering and wintering populations and assess their condition. Take action to minimize habitat loss and maintain contiguous habitats by restoring, enhancing, and/or protecting woodland and riverine habitats and waterways on public and private lands through direct purchase or easements. Enlist private landowners in preservation programs, where appropriate, to maintain suitable habitats free of human disturbance during key periods. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Protect habitat – Landscape Project)*
Protect critical forest and forested wetland habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining forest parcels; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect critical scrub-shrub habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining parcels of scrub-shrub habitat; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect and enhance water quality	
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*

Priority	Conservation Actions (continued)
2º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. Seek appropriate classifications for stream segments based on Index of Biotic Integrity (IBI) results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
2º	Protect water quality through the enforcement of Clean Vessel Act regulations. Boaters to observe pump-out and no discharge zone designations. *(Protect habitat – rare wildlife, fish)*
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Enhance or restore habitats for colonial waterbirds through the elimination or reduction of phragmites from dredge material sites to allow for the natural succession of woody habitats to benefit nesting long-legged wading birds or the creation of sandy substrate for ground nesting colonial waterbirds at selected sites. Restoration efforts should focus on historic dredge material sites, so as to not further reduce the available locations for sediment deposit. If an active site is selected for restoration, efforts should be focused on areas that will not interfere with the sites' capacity to accept sediment. "Jump-start" natural vegetation (using nursery stock and seedlings) where appropriate. *(Conserve wildlife – rare wildlife, invasives)*
1º	Develop, implement, and evaluate best management practices to address adverse effects of invasive plant and wildlife species (e.g. phragmites, mute swan) and over-abundant native wildlife (e.g. resident Canada geese, greater snow goose) on the quality of coastal wetland habitat. *(Conserve wildlife – invasives; Other practice – land management)*
2º	Assess impacts of gull populations (laughing gull, greater black-back gull, herring gull) on the breeding success of beach nesting birds, colonial waterbirds, and other species to determine if integrated wildlife damage management of gulls is necessary. *(Conserve wildlife –, subsidized predators)*
2º	Monitor encroachment of Japanese sedge in beach/dune habitat, assess impacts on habitat quality, implement control efforts (e.g., herbicide and physical removal of plants) where appropriate, and research additional control methods. *(Evaluate restoration – invasives)*
2º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the level of potential impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
2º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for species of conservation concern. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
Inventory, determine distribution, and monitor wildlife and fish	
1º	Conduct surveys and review existing databases to better identify the migratory songbird species using coastal habitat and the distribution of the species. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
1º	Conduct research to quantify the importance of shrub-scrub habitat for migratory songbirds. *(Protect habitat – migratory birds)*
1º	Conduct surveys to determine distribution, population, and habitat use of coastal marsh birds, in particular high marsh specialists, such as Northern harrier, black rails and salt marsh sharp-tailed sparrow. *(Monitor wildlife – long-term monitoring; Conserve Wildlife – rare wildlife)*
1º	Research population distribution of northern diamondback terrapin to determine critical areas for protection. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify key road-crossing areas of northern diamondback terrapin and work with appropriate government agencies to install turtle crossing signs and erect turtle barriers or provide safe passage, as appropriate, depending on the habitat and location. *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors - roads)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland and barrier island colonies of colonial waterbirds (not covered by aerial surveys), with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Continue the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring; Protect habitat – migratory birds; Conserve wildlife – game species)*
2º	Continue the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – game species)*
2º	Conduct baseline inventory of the marsh rice rat, southern bog lemming, and seals and develop long-term monitoring plans to determine each species' population trend. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Investigate home ranges of wintering Atlantic brant in relation to carrying capacity of back-bay habitat for Atlantic brant. *(Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans; Corridors – migratory birds)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap and band bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Assess significance of coastal region as an important travel corridor and concentration site for migratory tree bats through comparative surveys of their distribution through radio-telemetry, acoustical monitoring, mist-netting, and field searches during the migratory season. *(Protect habitat – Landscape Project)*
2º	Identify and research water quality parameters for various species' populations including but not limited to long-legged colonial waterbirds, bald eagle, osprey, northern diamondback terrapin, and other water-dependent coastal species. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
2º	Survey and monitor bald eagle nest occupancy and reproductive success, and identify and monitor concentration and roosting areas to understand their role in population maintenance. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Prevent, stabilize, and reverse declines of wildlife and fish populations	
1º	Reduce deleterious effects of pesticides on coastal species and ecosystems by conducting investigations that assess the impacts of pesticides and biological controls on coastal species, in particular those species dependent on coastal marshes and wetlands. Evaluate and modify best management practices as appropriate. *(Other practices – land management)*
1º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
1º	Improve marsh management techniques to benefit critical wildlife species by conducting critical assessments of the effects of Open Marsh Water Management on wildlife species, in particular high marsh nesting birds and waterfowl. Evaluate and modify best management practices as appropriate. *(Conserve wildlife – rare wildlife, game species; Other practices – land management)*
1º	Develop, implement, and evaluate management actions to enhance populations of special concern and rare fish, and implement adaptive management strategies. *(Conserve wildlife – rare wildlife; Protect habitat - fish)*

Priority	Conservation Actions (continued)
1º	Conduct research to assess the potential impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations. Conduct studies and create models to identify migratory routes of and assess the potential impacts of wind turbines, tall buildings, radio towers and other "human-made" tall structures to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans)*
2º	Enhance northern diamondback terrapin populations by closing the harvest season until sustainable population levels are reached. Determine if protective regulations are sufficient, in conjunction with naturally occurring survivorship rates, to reduce mortality in northern diamondback terrapin populations. *(Conserve wildlife – rare wildlife)*
2º	Determine compliance with current crab trap regulations (e.g. turtle excluder devices) and increase enforcement if necessary. *(Conserve wildlife – rare wildlife)*
2º	Increase research efforts on the northern diamondback terrapin, including studies focusing on reproductive success, the effects of predators on productivity and developing sustainable population goals. *(Conserve wildlife – rare wildlife)*
2º	Investigate impacts of aquaculture on waterfowl and other wildlife. Determine relative effects of locations and aquaculture techniques. If possible, develop management actions or aquaculture techniques to minimize impacts. *(Aquaculture – land management; Conserve wildlife – game species)*
2º	Determine carrying capacity of coastal salt marshes for wintering American black ducks and Atlantic brant to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
2º	Investigate crab dredging impacts on back-bay habitats and wildlife. Determine if any restrictions are necessary to protect wildlife or habitats. If needed, determine the nature of restrictions on dredging activities that will achieve protection. *(Protect habitat – humans)*
2º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Work with USFWS to implement reintroduction of northeastern beach tiger beetle at Holgate Unit of Edwin B. Forsythe NWR. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
2º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
2º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
Monitor and protect osprey and peregrine falcon	
1º	Continue monitoring all known pairs of peregrine falcon, including assessment of productivity and threats. Track other regularly observed peregrine falcons to determine new nesting pairs/sites. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife*
1º	Continue monitoring osprey, including coast wide survey of population and nesting success on biannual basis, and annual assessment of reproductive success at targeted locations. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Maintain nesting opportunities through repair and replacement of existing man-made structures. Identify where additional nesting structures would be appropriate, such as the Edwin B. Forsythe NWR and Great Bay WMA. *(Conserve wildlife – rare wildlife)*
2º	Continue to monitor fish stocks, in particular menhaden, to determine the effects of reduced or changing prey base on the reproductive success of osprey. *(Monitor wildlife – long-term monitoring)*
Protect beach nesting bird sites and foraging habitat	
1º	Continue intensive monitoring of populations and reproductive success of beach nesting birds, including piping plover, least tern, black skimmer, common tern and American oystercatcher. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Continue surveys of wintering population of American oystercatchers to determine abundance, distribution, and population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare species)*

Priority	Conservation Actions (continued)
1º	Continue existing management practices that minimize impacts of human disturbance (e.g., fence, post, and patrol nesting sites). Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
1º	Reduce excessive predation on beach nesting birds by working with local municipalities and other landowners to develop policies and/or establish regulations that minimize the impacts of predators on native wildlife species, including bans on feeding of wildlife and bans on "managed" cat colonies near critical wildlife areas. *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce fox predation on beach nesting birds at North Brigantine Natural Area either through integrated wildlife damage management or by encouraging trapping at the site during the legal hunting season. Work with USFWS and USDA-APHIS to reduce predation at Little Beach Island and the Holgate Unit of the Edwin B. Forsythe NWR, federally owned sites crucial to the recovery of piping plover in the state. *(Conserve wildlife – subsidized predators)*
2º	Research and monitor comparative reproductive success of American oystercatcher and common terns on beach- vs. marsh-nesting habitat at selected sites, including identification of specific threats. *(Conserve wildlife – rare wildlife)*
2º	Incorporate enforcement of pet restriction regulations into beach nesting bird plans and agreements. Strengthen law enforcement of no pet restrictions (e.g., dog ordinances) by state and federal conservation officers and park rangers. *(Protect habitat – humans)*
2º	Increase regular presence of state conservation officers at beach nesting bird sites during the nesting season. *(Protect habitat – humans)*
Reduce negative impacts on colonial nesting birds	
1º	Increase frequency of coast wide aerial colonial waterbirds surveys to once every other year to better determine population trends and distribution. Continue critical investigation of aerial survey technique through selected "ground truthing" and literature and peer review in order to increase efficacy of survey, minimize surveyor bias and error, and increase accuracy of trend data. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Reduce watercraft impacts on colonial waterbirds. Use GIS measures, other remote sensing tools, and surveys to identify important foraging areas and habitats and establish, post, and enforce buffers to restrict watercraft and pedestrian use around nesting areas. Elicit assistance from staff at Edwin B. Forsythe NWR to implement on refuge lands. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
2º	Investigate habitat selection of breeding colonial waterbirds, including use of phragmites. *(Protect habitat – Landscape Project)*
2º	Determine reproductive success of colonial waterbirds at targeted nesting colonies. Identify factors limiting success (e.g., predators and possible effects of contaminants). *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife, contaminants)*

Priority	Conservation Actions (continued)
2º	Conduct investigations to establish appropriate buffer sizes to minimize disturbance from watercraft and pedestrians at colonial bird nesting sites. *(Protect habitat – humans)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion. Focus within this zone should be on beach erosion and loss of coastal marshes and coastal bay islands.
Protect and enhance important and unique habitats	
1º	Acquire or facilitate acquisition of land adjacent to Edwin B. Forsythe NWR, Absecon WMA, and Great Bay WMA to fill critical gaps in public land holdings and/or to buffer existing holdings. *(Protect habitat – Landscape Project; Corridors – sprawl)*
1º	Identify specific areas of the Brigantine-Great Bay conservation zone where it would be appropriate to restrict human activities detrimental to wildlife or habitat through the establishment of a Marine Conservation Zone or equivalent regulatory restrictions. *(Protect habitat – Landscape Project, humans)*
2º	Identify species, such as colonial waterbirds, peregrine, and osprey that would benefit from habitat restoration at the "Fish Factory" site. Work with appropriate agencies to develop and implement a habitat restoration plan. *(Conserve wildlife – rare wildlife)*
Promote public education and awareness	
1º	Create viewing opportunities for beach nesting birds and shorebirds at North Brigantine Natural Area, and for colonial water birds at selected appropriate locations. Develop and install interpretive signage at wildlife viewing locations. *(Education – humans)*
1º	Develop and present educational programs to local environmental organizations, community groups, and schools to promote understanding of threats to beach nesting birds, colonial water birds, osprey, and for other coastal species as needed, and to increase environmental stewardship. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are a major source of nonindigenous species that invade natural plant communities. *(Education – humans)*
1º	Develop targeted outreach brochures for pet owners to reduce negative impacts to beach nesters and migratory and breeding shorebirds from domestic dog activity and free-roaming cats. *(Education – humans)*

Priority	Conservation Actions (continued)
1º	Develop a brochure and/or poster which targets boat and jet-ski operators in order to help minimize their impact on wildlife. The outreach materials should include general information about what wildlife may be encountered, and the proper etiquette and appropriate practices for operating watercraft in the vicinity of wildlife and/or areas posted to protect wildlife. *(Education – humans)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop and encourage opportunities for eco-tourism in the coastal zone including but not limited to the creation of viewing opportunities, interpretive trails, and other wildlife viewing experiences. *(Education – humans)*
2º	Work with New Jersey Division of Parks and Forestry (NJDPF) to develop and enhance outreach opportunities with regards to beach nesting birds and other wildlife species at North Brigantine Natural Area. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Develop an outreach brochure about northern diamondback terrapin biology, behavior, and threats, specifically targeting recreational (crab pot) crabbers that can be distributed when they are applying for their crabbing licenses. *(Education – humans)*
2º	Provide public education and outreach efforts focused on NJ's Clean Marina Program and encourage marina owners, boaters, etc. to adopt voluntary practices aimed at preventing adverse impacts to water quality. *(Education – humans)*
2º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, backyard habitat management, and Citizen Science Program. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Work with private landowners to maintain or create scrub-shrub habitat for migratory songbirds, raptors and butterflies through promotion of "backyard habitat" program.
- Encourage private owners of dredge material islands to create or enhance habitat suitable for colonial nesting birds through landowner incentive programs.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.

Public

- Expand volunteer Citizen Scientist Program recruitment and activities.
  - Collaborate with conservation groups (NJ Audubon Society, local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation, etc.) and other environmental, member-based organizations to recruit and train Citizen Scientists to

locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
  - Recruit Citizen Scientists and conservation groups to assist with surveying and monitoring of wildlife, including colonial waterbirds, osprey, peregrine falcon, and migratory shorebirds and songbirds.
  - Involve Citizen Scientists in management and protection projects, such as fencing beach nesting bird breeding sites, erection and placement of osprey nesting platforms, and other appropriate projects.
  - Elicit public assistance for wildlife management projects at North Brigantine Natural Area from beach buggy and fishing organization (e.g., New Jersey Beach Buggy Association).

Wildlife Professionals

- Collaborate with researchers and wildlife managers from other Atlantic coast states to develop best management practices, conservation plans, and surveying protocol for colonial waterbirds, beach nesting birds, and other coastal species.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Coordinate efforts to protect diamondback terrapin with The Wetlands Institute, especially in identifying areas of high road mortality and to insure that data collection addresses conservation needs.
- Elicit assistance from New Jersey Audubon Society, in particular through coordinated Citizen Scientist Program, to assist in various bird surveys.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds of conservation need.
- Work with the Tuckerton Seaport and Jacques Cousteau National Estuarine Research Reserve to coordinate conservation efforts and develop outreach opportunities.
- Work with conservation organization such as New Jersey Audubon Society, Atlantic Audubon Society, American Bird Conservancy, Cats Indoors!, etc. to develop advocacy for appropriate conservation and regulatory issues.
- Encourage the use of Landscape Project critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres and local land trusts.

Academic Institutions

- Collaborate with Richard Stockton College's Coastal Research Center to develop scientific comparisons of manipulated and natural beach systems that can be used to develop model to identify suitable beach nesting bird micro-habitats, which can be incorporated into beachfill project designs.
- Work with Richard Stockton College to develop appropriate projects for internship program.
- Work with Rutgers University to develop appropriate graduate level research projects in the coastal area, in particular focusing on beach nesting birds and colonial waterbirds.
- Work with Rutgers University Marine Field Station to develop research projects and help integrate aquatic and terrestrial resource needs of the estuary.

- Work with Drexel University on northern diamondback terrapin research and help frame projects to meet conservations needs.
- Work with Rutgers University Center for Remote Sensing and Spatial Analysis to develop predictive modeling and GIS mapping of areas that will be potentially impacted by sea-level rise.
- Collaborate with other US and Canadian universities on migration and wintering ecology of waterfowl and other birds of conservation need.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USFWS - NJ Field Office, US Army Corps. of Engineers (USACE), USDA, non-profit organizations, Department of Community Affairs (DCA), and Office of Smart Growth to protect, enhance, and create habitats; and protect populations of coastal species.
    - Municipalities, NJ Department of Environmental Protections Division's (DEP) of Fish and Wildlife (DFW) and Parks and Forestry (DPF), the State Wildlife Control Unit, USDA-APHIS-Wildlife Services, and local animal control officers to work together to reduce the effects of predators, especially red fox, on beach nesting birds and other critical wildlife.
    - DFW to work with the City of Brigantine and the Division of Parks and Forestry to implement management agreement for North Brigantine Natural Area in a way that best protects resources.
    - DFW to work with the City of Brigantine to modify existing beach management practices on municipal beaches at southern end of Brigantine Island to restore habitat for beachnesting birds.
    - DFW and USFWS staff to work to create habitat and implement best management practices for coastal marsh birds and migratory songbirds and raptors on federal refuge and state lands.
    - DFW to work with the USACE and state dredging programs to create and maintain habitat for nesting colonial waterbirds.
    - DFW to coordinate development and implementation of beachnesting bird management plans with USFWS, NJDEP, and local municipalities.
    - DFW to work with Edwin B. Forsythe National Wildlife Refuge (NWR) to meet conservation and management goals of the zone and to develop protocol for inventory of wildlife present on refuge lands.
    - DFW and conservation organizations to work with appropriate local, county, and state road departments to reduce road mortality to diamondback terrapins, in particular in areas identified as having high-density populations or high incidence of mortality.
    - DFW to continue protection measures for northern diamondback terrapin by requiring excluders on commercial crab traps in small creeks and lagoons.
    - DFW and local municipalities to limit public access and disturbance to colonial waterbird breeding colonies and increase presence at beach nesting bird breeding sites.

  - DFW to work with state and county mosquito commissions to assess the impacts of insecticides and biological controls on critical wildlife, and improve best management practices for marsh management.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration (NRCS) to plan for and assist with emergency oil spill response.
  - DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in waterbodies where listed or special concern species occur.
  - DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
  - DFW to work with DEP's Land Use Regulation Program (LURP) to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, conservation organizations, and land stewards to work with NJ Coastal Heritage Trail to develop more wildlife focused trail destinations or viewing areas, and to elevate the importance of eco-tourism.
  - DFW to work with NJDEP-OEC, USACE, and other appropriate agencies to develop and implement best management practices for making dredge spoil deposition sites attractive to breeding, migrating and wintering wildlife.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need, their habitats, the potential harmful effects of disturbance on beach nesting and coastal marsh birds, and the importance of the Atlantic Flyway and its associated migratory stopover sites.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and colonial waterbird viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, local land trusts, and through mitigation.
- DEP to encourage the use of Landscape Project critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time.
- Monitor efficacy of habitat management, habitat restoration, and invasive species control projects.

- Continue to annually monitor abundance, productivity, distribution, and trends of breeding piping plover, black skimmer, least tern, common tern, American oystercatcher (beach nesting population only), osprey (biennial), peregrine, colonial waterbirds (biennial), as well as wintering waterfowl and migratory shorebird communities. Conduct threat assessment including factors relating to nest failure and brood loss.
- Collect baseline data (distribution and abundance) for other coastal species, such as marsh birds, migratory songbirds and raptors, diamondback terrapin, and coastal mammals including bats.
- Conduct Delphi Process every three to four years to update status of coastal species.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

4. Barnegat Bay - Little Egg Harbor

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

The Barnegat Bay - Little Egg Harbor zone spans the eastern edge of southern Ocean County, including all of Long Beach Island, as well as Island Beach State Park directly to the north (Figure 8). The vegetated dune communities of Island Beach State Park extend almost eight miles, making this one of the few and largest sections of undeveloped barrier island in the state. In contrast, beaches in resort towns to the north and Long Beach Island to the south, where limited (or no) dune systems exist, provide limited habitat for coastal species. The zone includes a large portion of Barnegat Bay, the state's largest and longest coastal back-bay, and the extensive saline marshes of the Edwin B. Forsythe NWR and Manahawkin WMA. Across Little Egg Harbor and Barnegat Bay, there are tidal salt meadows and marshes, shallow inlets and coves, upland pitch pine forests, oak forests, and white cedar-red maple swamps.

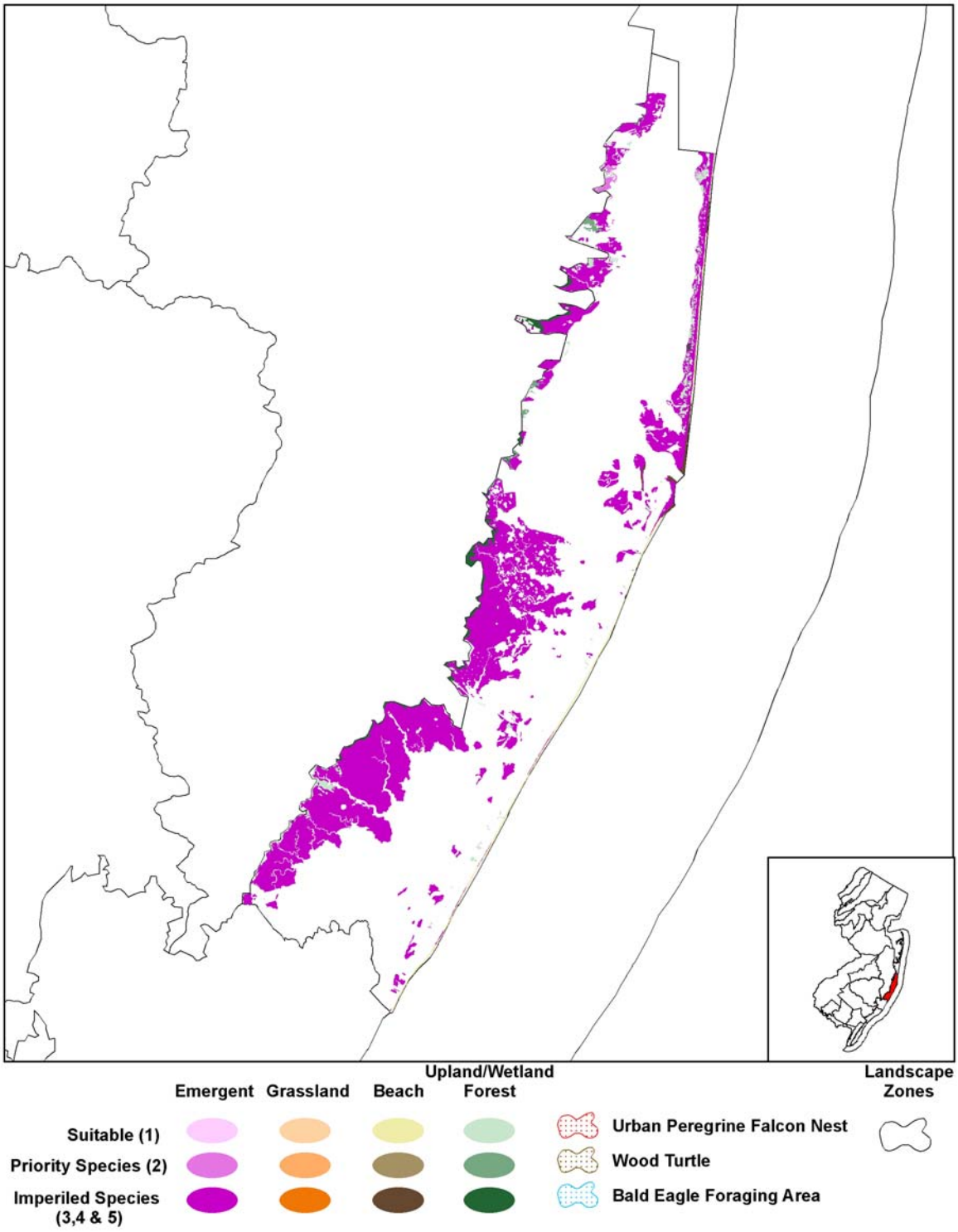
The conservation areas of opportunity in the Barnegat Bay - Little Egg Harbor zone are the Edwin B. Forsythe NWR (Barnegat Division), Manahawkin WMA, Island Beach State Park (including the Southern and Northern Natural Areas, and Sedge Islands WMA and Marine Conservation Zone). Beach habitat at the Barnegat Lighthouse State Park and the adjoining portion of the beach along the inlet jetty have historically provided important habitat for large numbers of beach nesting birds, and could so again if habitat restoration was implemented.

The beach/dune and coastal wetland/waterways habitats are the priority habitats in the coastal landscape region. Coastal wetlands and their associated waterways support the greatest diversity of species of conservation concern, whereas the beaches and dunes provide habitat for some of the state's most critically threatened species. These habitats are the most representative of the region and because of the intensive recreational usage within these habitats they should receive priority conservation status. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority within this region, although they still provide critical habitat for migratory birds, butterflies, and other species. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this region.

b. Wildlife of Greatest Conservation Need

The Barnegat Bay - Little Egg Harbor zone supports eleven federally endangered or threatened species, nine state endangered species, five state threatened species, and 42 species of special concern or regional priority. The federally endangered or threatened species are bald eagle, bog turtle, piping plover, northeastern beach tiger beetle (reintroduction candidate), roseate tern (historical), as well as sea turtle species that may enter the region's inlets and bays. In addition, summer or migratory populations of bats, potentially including the federally endangered Indiana bat, are suspected to occur in the zone. American bittern, black skimmer, least tern, northern harrier, peregrine falcon, pied-billed grebe, sedge wren, short-eared owl, and Cope's gray treefrog are state endangered. Black rail, black- crowned night-heron, osprey, red knot, and

Figure 8. Critical landscape habitats within the Barnegat Bay - Little Egg Harbor conservation zone, as identified through the Landscape Map (v2).



yellow-crowned night-heron are state threatened. Special concern wildlife include American oystercatcher, common terns, various species of herons and egrets, eastern box turtle, northern diamondback terrapin, and Fowler's toad. Back-bay salt marshes and coastal sounds in this area are critical wintering areas for Atlantic brant and American black ducks in the Atlantic Flyway. Significant numbers of lesser and greater scaup winter in this area. Other game species, most notably selected waterfowl species, have been assigned priority status.

The protected dunes of Island Beach State Park, in particular the Southern Natural Area are nesting and foraging habitat for beach nesting birds and shorebirds, including American oystercatcher, black skimmer, least tern, and piping plover. This area could also provide habitat for the reintroduction of the northeastern beach tiger beetle. Marsh islands, including some dredge spoil sites provide significant nesting habitat for colonial waterbirds, black skimmer, and common tern. Tidal marshes are foraging habitat for coastal marsh birds and northern diamondback terrapin. Marsh habitat, in particular in the Sedge Island WMA provide critical nesting habitat for osprey and peregrine falcon, while the Eastern box turtle, Cope's gray treefrog, and Fowler's toad inhabit upland forests and wetlands. Marine mammals, sea turtles, and some species of anadromous fish utilize estuarine habitat, including inlets and bays. Harbor seals also use sandy beaches and sand bars just inside Barnegat Inlet as winter "haul-out" locations. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Barnegat Bay – Little Egg Harbor Zone

Table C30. Federal Endangered and Threatened Species*

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Birds				
Piping plover		X		
Roseate tern		X	X	
Reptiles				
Bog turtle			X	
Green sea turtle♦	X			
Hawksbill sea turtle♦	X			
Kemp's ridley sea turtle♦	X			
Leatherback sea turtle♦	X			
Loggerhead sea turtle♦	X			
Insects				
Northeastern beach tiger beetle		R		

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦ Sea turtles only present in water (inlets, bays, and estuaries).
R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table C31. State Endangered Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American bittern			X	
Bald eagle			X	X
Black skimmer		X	X	
Least tern		X		
Northern harrier			X	X

State Endangered Species (continued)

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
Peregrine falcon			X	
Pied-billed grebe			X	
Sedge wren			X	
Short-eared owl			X	X
Amphibians				
Cope's gray treefrog			X	

X: Species occurs within the identified habitat.

Table C32. State Threatened Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
Black rail			X	
Black-crowned night heron			X	X
Osprey		X	X	
Red knot		X	X	
Yellow-crowned night heron			X	X

X: Species occurs within the identified habitat.

Table C33. Nongame Species of Conservation Concern

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Harbor porpoise	X			
Harbor seal♦	X	X		
Marsh rice rat			X	
Southern bog lemming			X	X
Birds				
American golden-plover			X	
American oystercatcher		X	X	
Black tern		X		
Caspian tern		X		
Cattle egret			X	
Chimney swift				X
Common barn owl				X
Common tern		X	X	
Forster's tern			X	
Glossy ibis			X	
Great blue heron				X
Great crested flycatcher				X
Great egret			X	
Greater yellowlegs			X	
Green heron			X	X
Gull-billed tern		X	X	
Horned lark		X		
Hudsonian godwit			X	
King rail			X	
Least bittern			X	
Little blue heron			X	
Marbled godwit			X	
Marsh wren			X	
Nelson's sharp-tailed sparrow			X	
Purple sandpiper		X		
Royal tern		X		
Ruddy turnstone		X	X	
Saltmarsh sharp-tailed sparrow			X	
Sanderling		X	X	
Seaside sparrow			X	
Semipalmated sandpiper		X	X	
Snowy egret			X	
Tricolored heron			X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds (continued)				
Whimbrel			X	
Willet		X	X	
Wilson's phalarope		X	X	
Reptiles				
Eastern box turtle				X
Northern diamondback terrapin		X	X	
Amphibians				
Fowler's toad		X		
Fish				
Atlantic sturgeon	X			

♦Harbor seal primarily present in water, but utilize beach as "haul-outs".
X: Species occurs within the identified habitat.

Table C34. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American black duck	X		X	
Atlantic brant	X		X	
Black scoter	X			
Bufflehead	X		X	
Canada goose (Atlantic population)	X		X	
Canvasback	X		X	
Clapper rail			X	
Common eider *	X			
Greater scaup	X		X	
Harlequin duck*	X			
Lesser scaup	X		X	
Long-tailed duck	X			
Northern pintail	X		X	
Surf scoter	X			
Virginia rail			X	
White-winged scoter	X			

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
X: Species occurs within the identified habitat.

Table C35. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table C36. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJ DFW to be species of concern.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
River otter	X		X	
Birds				
Sora rail			X	

X: Species occurs within the identified habitat

c. Threats to the Wildlife and Habitats

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Narrow, steep beaches with little dune system, which are characteristic of Long Beach Island, the major barrier island in the zone, provide limited suitable nesting habitat for beach nesting birds. Intensive dune management, including overuse of dune fencing and unnecessary beach grass planting (i.e. where adequate storm protection already exists), exacerbates the poor quality of the habitat. A major beach replenishment project planned for the island could create more suitable habitat, but municipal management of the beach would have to be closely monitored to ensure that activities, such as mechanical beach raking, don't jeopardize nesting opportunities or nesting success and/or reduces available foraging habitat for piping plovers and migratory shorebirds. Intense off-road vehicle usage on Island Beach State Park severely degrades oceanfront beach habitat for beach nesting birds and northeastern beach tiger beetles. Development of remaining coastal scrub-shrub and forested habitat reduces habitat critical for migratory raptors, songbirds and butterflies. Stabilization and manipulation of the Barnegat Inlet (e.g., jetties, revetment, geotubes, ongoing dredging, etc.) reduces natural formation of habitat, creates impediments or reduction of foraging and nesting opportunities for some species (piping plovers, northern diamondback terrapin). Invasive plant species, such as phragmites, which dominate many dredge disposal sites and some coastal salt marshes, reduce the suitability of habitat for critical coastal species, including breeding long-legged wading birds, high marsh specialists, and waterfowl. The impacts of aquaculture, particularly for hard clams (*Mercenaria mercenaria*), as well as hydraulic crab dredging are largely unmeasured and poorly understood.

Heavy recreational use of all beaches on Long Beach Island (exception: Borough of Barnegat Light) limits nesting opportunities and potential success for beach nesting birds and also creates disturbance to a wide range of migrating shorebirds. Off-road vehicle use on the oceanfront portion of Island Beach State Park, particularly the southern end, creates on-going disturbance that strongly reduces the likelihood of beach nesting birds selecting the site to nest, and causes disturbance to migratory (foraging) shorebirds. Boats and personal watercraft create disturbance at back-bay colonial waterbird colonies and osprey nests, and interfere with foraging throughout the region.

Excessive predation, especially by human subsidized species (e.g., red fox, crow, gull species, raccoon, striped skunk, free-roaming "owned" or feral cats), severely impairs beach nesting bird and colonial waterbirds breeding success. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, enhance, and/or restore critical habitats identified by the Landscape Project, focusing primarily on habitat for beach dependent species such as piping plover,

least tern, black skimmer, and migratory shorebirds (e.g., red knots). The beach/dune habitat is one of two priority habitat types in this zone.

- Identify, protect, enhance, and/or restore suitable coastal wetlands and waterways for wildlife species of conservation concern such as waterfowl, colonial waterbirds (e.g., long-legged, wading birds), secretive marsh birds" (i.e. bitterns, rails), northern diamondback terrapin, and the harbor seal. The coastal wetland/waterways habitats are the second group of priority habitats in this zone.
- Identify, protect, enhance, and/or restore suitable forest and wetland forest habitat for wildlife species of conservation concern, particularly for raptors, forest-dwelling bats, and yellow- and black-crowned night herons. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this zone.
- Identify, protect, enhance, and/or restore suitable scrub-shrub habitat (areas with >25% woody vegetation <15 feet in height, including late successional back dune vegetative communities, often characterized by presence of bayberry) for wildlife species of conservation concern, particularly migratory songbirds, raptors, butterflies, and other species. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority in this zone.
- Protect and enhance water quality to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Inventory, determine distribution, and monitor endangered, threatened, special concern, and regional priority wildlife and fish species in the Barnegat Bay – Little Egg Harbor Zone.
- Prevent, stabilize and reverse declines of endangered, threatened, and rare species and special concern fishes.
- Continue to monitor and protect osprey and peregrine falcon.
- Protect beach nesting bird sites and associated foraging habitats from human disturbance, predation, and other threats.
- Reduce the impacts of human disturbance, predation, and other threats on colonial nesting birds.
- Assess large-scale habitat change (every five to 10 years) focusing on beach erosion and loss of coastal marshes and coastal bay islands.
- Protect and enhance important and unique natural communities.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Atlantic Coastal Regional Landscape stakeholders during a meeting held on March 29, 2007 (see *Attachment H*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical beach/dune, coastal scrub-shrub, forest, and wetland habitats and assess their condition for nesting, migrating, and wintering birds, and other coastal species. Take action to minimize habitat loss by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or habitat management plans. Maintain information and incorporate all new survey and mapping data into the Landscape Project and Biotics database. *(Protect habitat – Landscape Project)*
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify areas where additional habitat-based regulatory measures or land acquisition would be appropriate to benefit wildlife species of conservation concern.
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Develop, implement, and evaluate best management practices to protect, enhance, and restore upland habitat to maintain the migration of raptor (with a main focus on osprey and peregrine falcon) and passerine populations (with a focus on scrub-shrub inhabitants) at viable levels. Develop an action plan for immediate implementation should habitat levels fall below the minimum necessary to sustain the migration. Actively manage state and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*

Priority	Conservation Actions (continued)
Protect critical beach habitat for wildlife species of conservation concern	
1º	Work with the U.S. Army Corps of Engineers (USACE) and the NJDEP Office of Construction and Engineering (OCE) to integrate designs into beach nourishment projects that increase availability of and access to nesting and foraging habitat for beachnesting birds, in particular at beaches adjacent to Barnegat Inlet. *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs) for dune management policies, to incorporate into beach nesting bird management agreements, through collaborative efforts with the U.S. Department of Agriculture (USDA) – Natural Resources Conservation Services (NRCS), U.S. Fish and Wildlife Service (USFWS), USACE, and NJDEP LURP. *(Other practices – land management; Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Investigate the efficacy of experimental techniques (e.g., restoration, enhancement) to improve foraging habitat on nourished beaches for beachnesting birds. *(Conserve wildlife – rare wildlife)*
2º	Restore or enhance nesting and foraging habitat for beach nesting birds, including piping plovers, least terns, black skimmers, common terns, and American oystercatchers on the south side of the Barnegat Inlet. Restoration efforts include reduction of mature dunes and dense beach vegetation to create more suitable nesting habitat and the creation of tidally-flushed ponds for improving foraging habitat. *(Conserve wildlife – rare wildlife)*
Protect critical coastal wetland habitat and waterways for wildlife species of conservation concern	
1º	Work with NJDEP-OCE, USACE, and other appropriate agencies to coordinate beneficial placement of dredge materials for creation, enhancement, or maintenance of colonial waterbird nesting, in particular with regards to Intercoastal Waterway restoration projects. *(Conserve wildlife – rare wildlife; Other practices – land management)*
1º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl.
2º	Develop, implement, and evaluate best management practices for making dredge spoil deposition sites attractive to breeding, migrating, and wintering wildlife. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Reestablish/restore historically important submerged aquatic vegetation beds to benefit waterfowl species. *(Conserve wildlife – game species)*
2º	Protect overwintering colonies and/or "haul out" areas for harbor seals by using GIS measures, other remote sensing tools, and surveys to identify important "haul-out" areas (e.g. Barnegat Inlet) and post them to minimize human disturbance. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
2º	Identify locations where undoing the effects of wetland ditching can benefit marsh species, especially high marsh or area-sensitive species, such as northern harriers. Implement restoration of these sites. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Use GIS, other remote sensing tools, and surveys to identify critical habitats supporting local bald eagle nesting, summering and wintering populations and assess their condition. Take action to minimize habitat loss and maintain contiguous habitats by restoring, enhancing, and/or protecting woodland and riverine habitats and waterways on public and private lands through direct purchase or easements. Enlist private landowners in preservation programs, where appropriate, to maintain suitable habitats free of human disturbance during key periods. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Protect habitat – Landscape Project)*
Protect critical forest and forested wetland habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining forest parcels; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect critical scrub-shrub habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining parcels of scrub-shrub habitat; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect and enhance water quality	
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. Seek appropriate classifications for stream segments based on Index of Biotic Integrity (IBI) results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*

Priority	Conservation Actions (continued)
2º	Protect water quality through the enforcement of Clean Vessel Act regulations. Boaters to observe pump-out and no discharge zone designations. *(Protect habitat – rare wildlife, fish)*
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Enhance or restore habitats for colonial waterbirds through the elimination or reduction of phragmites from dredge material sites to allow for the natural succession of woody habitats to benefit nesting long-legged wading birds or the creation of sandy substrate for ground nesting colonial waterbirds at selected sites. Restoration efforts should focus on historic dredge material sites, so as to not further reduce the available locations for sediment deposit. If an active site is selected for restoration, efforts should be focused on areas that will not interfere with the sites' capacity to accept sediment. "Jump-start" natural vegetation (using nursery stock and seedlings) where appropriate. *(Conserve wildlife – rare wildlife, invasives)*
1º	Develop, implement, and evaluate best management practices to address adverse effects of invasive plant and wildlife species (e.g. phragmites, mute swan) and over-abundant native wildlife (e.g. resident Canada geese, greater snow goose) on the quality of coastal wetland habitat. *(Conserve wildlife – invasives; Other practices – land management)*
2º	Assess impacts of gull populations (laughing gull, greater black-back gull, herring gull) on the breeding success of beach nesting birds, colonial waterbirds, and other species to determine if integrated wildlife damage management of gulls is necessary. *(Conserve wildlife –, subsidized predators)*
2º	Monitor encroachment of Japanese sedge in beach/dune habitat, assess impacts on habitat quality, implement control efforts (e.g., herbicide and physical removal of plants) where appropriate, and research additional control methods. *(Evaluate restoration – invasives)*
2º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the level of potential impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
2º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for species of conservation concern. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
Inventory, determine distribution, and monitor wildlife and fish	
1º	Conduct surveys and review existing databases to better identify the migratory songbird species using coastal habitat and the distribution of the species. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
1º	Conduct research to quantify the importance of shrub-scrub habitat for migratory songbirds. *Protect habitat – migratory birds)*
1º	Conduct surveys to determine distribution, population, and habitat use of coastal marsh birds, in particular high marsh specialists, such as Northern harrier, black rails and salt marsh sharp-tailed sparrow. *(Monitor wildlife – long-term monitoring. Conserve wildlife – rare wildlife)*
1º	Research population distribution of northern diamondback terrapin to determine critical areas for protection. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify key road-crossing areas of northern diamondback terrapin and work with appropriate government agencies to install turtle crossing signs and erect turtle barriers or provide safe passage, as appropriate, depending on the habitat and location. *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors - roads)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland and barrier island colonies of colonial waterbirds (not covered by aerial surveys), with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Continue the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring; Protect habitat – migratory birds; Conserve wildlife – game species)*
2º	Continue the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – game species)*
2º	Conduct baseline inventory of the marsh rice rat, southern bog lemming, and seals and develop long-term monitoring plans to determine each species' population trend. *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife)*
2º	Investigate home ranges of wintering Atlantic brant in relation to carrying capacity of back-bay habitat for Atlantic brant. *(Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans; Corridors – migratory birds)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap and band bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Assess significance of coastal region as an important travel corridor and concentration site for migratory tree-roosting bats through comparative surveys of their distribution through radio-telemetry, acoustical monitoring, mist-netting, and field searches during the migratory season. *(Protect habitat – Landscape Project)*
2º	Identify and research water quality parameters for various species' populations including but not limited to long-legged colonial waterbirds, osprey, bald eagle, northern diamondback terrapin, and other water-dependent coastal species. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
Prevent, stabilize, and reverse declines of wildlife and fish populations	
1º	Reduce deleterious effects of pesticides on coastal species and ecosystems by conducting investigations that assess the impacts of pesticides and biological controls on coastal species, in particular those species dependent on coastal marshes and wetlands. Evaluate and modify best management practices as appropriate. *(Other practices – land management)*
1º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
1º	Improve marsh management techniques to benefit critical wildlife species by conduct critical assessments of the effects of Open Marsh Water Management on wildlife species, in particular high marsh nesting birds and waterfowl. Evaluate and modify best management practices as appropriate. *(Conserve wildlife – rare wildlife, game species; Other practices – land management)*
1º	Develop, implement, and evaluate management actions to enhance populations of special concern and rare fish, and implement adaptive management strategies. *(Conserve wildlife – rare wildlife; Protect habitat - fish)*

Priority	Conservation Actions (continued)
1º	Conduct research to assess the potential impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations. Conduct studies and create models to identify migratory routes of and assess the potential impacts of wind turbines, tall buildings, radio towers and other "human-made" tall structures to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans)*
2º	Enhance northern diamondback terrapin populations by closing the harvest season until sustainable population levels are reached. Determine if protective regulations are sufficient, in conjunction with naturally occurring survivorship rates, to reduce mortality in northern diamondback terrapin populations. *(Conserve wildlife – rare wildlife)*
2º	Determine compliance with current crab trap regulations (e.g. turtle excluder devices) and increase enforcement if necessary. *(Conserve wildlife – rare wildlife)*
2º	Increase research efforts on the northern diamondback terrapin, including studies focusing on reproductive success, the effects of predators on productivity and developing sustainable population goals. *(Conserve wildlife – rare wildlife)*
2º	Investigate impacts of aquaculture on waterfowl and other wildlife. Determine relative effects of locations and aquaculture techniques. If possible, develop management actions or aquaculture techniques to minimize impacts. *(Aquaculture – land management; Conserve wildlife – game species)*
2º	Determine carrying capacity of coastal salt marshes for wintering American black ducks and Atlantic brant to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
2º	Investigate crab dredging impacts on back-bay habitats and wildlife. Determine if any restrictions are necessary to protect wildlife or habitats. If needed, determine the nature of restrictions on dredging activities that will achieve protection. *(Protect habitat – humans)*
2º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Conduct pilot study and/or collaborate with USFWS to identify locations at Island Beach State Park appropriate for reintroduction of northeastern beach tiger beetle and gauge likelihood of success of reintroduction efforts. *(Conserve wildlife – rare wildlife)*
2º	Investigate carrying capacity of back-bay habitats for wintering greater and lesser scaup. *(Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
2º	Investigate the role of locally available contaminants in the ecology of greater and lesser scaup. *(Conserve wildlife – contaminants; Conserve wildlife – game species)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
Monitor and protect osprey and peregrine falcon	
1º	Continue monitoring all known pairs of peregrine falcon, including assessment of productivity and threats. Track other regularly observed peregrine falcons to determine new nesting pairs/sites. *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife)*
1º	Continue monitoring osprey, including coast wide survey of population and nesting success on biannual basis, and annual assessment of reproductive success at targeted locations, such as Sedge Islands WMA. *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife)*
1º	Maintain nesting opportunities through repair and replacement of existing man-made structures. Identify where additional nesting structures would be appropriate. *(Conserve wildlife – rare wildlife)*
2º	Continue to monitor fish stocks, in particular menhaden, to determine the effects of reduced or changing prey base on the reproductive success of osprey. *(Monitor wildlife – long-term monitoring)*
Protect beach nesting bird sites and foraging habitat	
1º	Continue intensive monitoring of populations and reproductive success of beach nesting birds, including piping plover, least tern, black skimmer, common tern and American oystercatcher, to determine population trends. *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife)*
1º	Continue surveys of wintering population of American oystercatchers to determine abundance, distribution, and population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare species)*
1º	Continue existing management practices that minimize impacts of human disturbance (e.g., fence, post, and patrol nesting sites). Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
1º	Protect beach nesting birds and minimize impacts on their reproductive success by incorporating limits on beach raking practices into beach nesting bird management agreements. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
1º	Reduce and mitigate impacts of human activities on beach nesting birds through the implementation of beach management agreements with municipalities on Long Beach Island as island-wide replenishment occurs. Develop agreement with Borough of Barnegat Light regardless of status of replenishment project as piping plovers already nest on their beach. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Reduce predation on beach nesting birds through current management techniques (i.e. predator exclosures, electric fence), and implementation of integrated wildlife damage management at important nesting sites for beach nesting birds (e.g., Island Beach State Park). *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce excessive predation on beach nesting birds by working with local municipalities to develop policies and/or establish regulations that minimize the impacts of predators (e.g., raccoons, gulls, red fox, feral and free-roaming cats) on beach nesting birds. *(Conserve wildlife – cats, subsidized predators)*
2º	Research and monitor comparative reproductive success of American oystercatcher and common terns on beach vs. marsh nesting habitat at selected sites, including identification of specific threats. *(Conserve wildlife – rare wildlife)*
2º	Incorporate enforcement of pet restriction (e.g., dog ordinances) regulations into beach nesting bird plans and agreements. Strengthen law enforcement of no pet restrictions by state and federal conservation officers and park rangers. *(Protect habitat – humans)*
2º	Increase regular presence of state conservation officers at beach nesting bird sites during the nesting season. *(Protect habitat – humans)*
Reduce negative impacts on colonial nesting birds	
1º	Increase frequency of coast wide aerial colonial waterbirds surveys to once every other year to better determine population trends and distribution. Continue critical investigation of aerial survey technique through selected "ground truthing" and literature and peer review in order to increase efficacy of survey, minimize surveyor bias and error, and increase accuracy of trend data. *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife)*
1º	Reduce excessive predation on colonial nesting birds through implementation of integrated wildlife damage management at important nesting sites for colonial waterbirds. *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce watercraft impacts on colonial waterbirds. Use GIS measures, other remote sensing tools, and surveys to identify important foraging areas and habitats and establish, post, and enforce buffers to restrict watercraft and pedestrian use around nesting areas. Elicit assistance from staff of Edwin B. Forsythe NWR to implement on refuge lands. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
2º	Investigate habitat selection of breeding colonial waterbirds, including use of phragmites. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Determine reproductive success of colonial waterbirds at targeted nesting colonies. Identify factors limiting success (e.g., predators and possible effects of contaminants). *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife, contaminants)*
2º	Conduct investigations to establish appropriate buffer sizes to minimize disturbance from watercraft and pedestrians at colonial bird nesting sites. *(Protect habitat – humans)*
2º	Identify coastal marsh islands within Barnegat Bay where the lack of sufficient wrack mats limits nesting for black skimmer and common terns. Create "artificial" nesting mats through raking and redistribution of wrack material in years when needed. *(Conserve wildlife – rare wildlife)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion. Focus within this zone should be on beach erosion and loss of coastal marshes and coastal bay islands.
Protect and enhance important and unique habitats	
1º	Continue stringent protection of Sedge Islands WMA through enforcement of existing state regulated marine conservation zone designation. Assess effectiveness of current designation of and determine if additional measures or regulations are needed to insure adequate protection of its wildlife and habitat. Implement appropriate changes. *(Protect habitat – Landscape Project)*
1º	Acquire or facilitate acquisition of land adjacent to the Edwin B. Forsythe NWR and Manahawkin WMA to fill critical gaps in public land holdings or buffer existing holdings. *(Protect habitat – Landscape Project; Corridors – sprawl)*
1º	Pursue acquisition or landowner agreements/easements to protect remaining private marsh islands within the Barnegate-Little Egg Harbor conservation zone. *(Protect habitat – Landscape Project)*
Promote public education and awareness	
1º	Create viewing opportunities for beach nesting birds at Barnegat Lighthouse State Park and Island Beach State Park, and for colonial water birds at selected appropriate locations. Develop and install interpretive signage at wildlife viewing locations. *(Education – humans)*
1º	Develop and present educational programs to local environmental organizations, community groups, schools, and the general public to promote understanding of threats to beach nesting birds, colonial water birds, osprey, and for other coastal species as needed, and to increase environmental stewardship. *(Education – humans)*

Priority	Conservation Actions (continued)
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*
1º	Develop targeted outreach brochures for pet owners to reduce negative impacts to beach nesters and migratory and breeding shorebirds from domestic dog activity and free-roaming cats. *(Education- humans)*
1º	Develop a brochure and/or poster which targets boat and jet-ski operators in order to help minimize their impact on wildlife. The outreach materials should include general information about what wildlife may be encountered, and the proper etiquette and appropriate practices for operating watercraft in the vicinity of wildlife and/or areas posted to protect wildlife. *(Education – humans)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop and encourage opportunities for eco-tourism in the coastal zone including but not limited to the creation of viewing opportunities, interpretive trails, and other wildlife viewing experiences. *(Education – humans)*
2º	Work with New Jersey Division of Parks and Forestry (NJDPF) to develop and enhance outreach opportunities with regards to beach nesting birds at state parks and natural areas, such as Barnegat Lighthouse State Park and Island Beach State Park. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Develop an outreach brochure about northern diamondback terrapin biology, behavior, and threats, specifically targeting recreational (crab pot) crabbers that can be distributed when they are applying for their crabbing licenses. *(Education – humans)*
2º	Provide public education and outreach efforts focused on NJ's Clean Marina Program and encourage marina owners, boaters, etc. to adopt voluntary practices aimed at preventing adverse impacts to water quality. *(Education – humans)*
2º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, backyard habitat management, and Citizen Science Program. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Work with private landowners to maintain or create scrub-shrub habitat for migratory songbirds, raptors and butterflies through promotion of "backyard habitat" program.

- Encourage private owners of dredge material islands to create or enhance habitat suitable for colonial nesting birds through landowner incentive programs.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.

Public

- Expand volunteer Citizen Scientist Program recruitment and activities.
  - Collaborate with conservation groups such as NJ Audubon Society, local land trusts, The Nature Conservancy – NJ Chapter, and NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
  - Recruit Citizen Scientists and conservation groups to assist with surveying and monitoring of wildlife, including colonial waterbirds, ospreys, peregrine falcons, and migratory shorebirds and songbirds.
  - Involve Citizen Scientists in management and protection projects, such as fencing beach nesting bird breeding sites, erection and placement of osprey nesting platforms, and other appropriate projects.

Wildlife Professionals

- Collaborate with researchers and wildlife managers from other Atlantic coast states to develop best management practices, conservation plans, and surveying protocol for colonial waterbirds, beach nesting birds, and other coastal species.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Elicit assistance from New Jersey Audubon Society, in particular through coordinated Citizen Scientist Program, to assist in various bird surveys.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds of conservation need.
- Work with conservation organization such as New Jersey Audubon Society, American Bird Conservancy, and Cats Indoors! to develop advocacy for appropriate conservation and regulatory issues.
- Work with the Tuckerton Seaport, Barnegat Bay Estuary Program, Save Barnegat Bay, and others to coordinate conservation efforts and develop outreach opportunities, in particular with regards to watershed and water quality issues in Barnegat Bay.
- Encourage the use of Landscape Project critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres and local land trusts.

Academic Institutions

- Collaborate with Richard Stockton College's Coastal Research Center to develop comparisons of manipulated and natural beach systems that can be used to develop a scientific model to identify suitable beach nesting bird micro-habitats, which can be incorporated into beach fill project designs.

- Work with Richard Stockton College to develop appropriate projects for internship program.
- Work with Rutgers University to develop appropriate graduate level research projects in the coastal area, in particular focusing on beach nesting birds, colonial waterbirds, and American oystercatcher.
- Work with Rutgers University Center for Remote Sensing and Spatial Analysis to develop predictive modeling and GIS mapping of areas that will be potentially impacted by sea-level rise.
- Collaborate with other US and Canadian universities on migration and wintering ecology of waterfowl and other birds of conservation need.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, NRCS, USFWS - NJ Field Office, US Army Corps. of Engineers (USACE), and USDA, non-profit organizations, and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats, and to protect populations of coastal species.
    - Municipalities, NJ Department of Environmental Protections Division's (DEP) of Fish and Wildlife (DFW) and Parks and Forestry (DPF), the State Wildlife Control Unit, USDA-APHIS-Wildlife Services, and local animal control officers to work together to reduce the effects of predators, especially red fox and feral cats, on beach nesting birds and other critical wildlife.
    - DFW and conservation organizations to develop stronger partnerships with municipal environmental commissions to gain support for local conservation efforts, in particular involving beach nesting birds.
    - DFW to create habitat and implement best management practices for coastal marsh birds and migratory songbirds and raptors on Wildlife Management Areas.
    - DFW to work with the U.S. Army Corps of Engineers (USACE) and state dredging programs to create and maintain habitat for nesting colonial waterbirds.
    - DFW to coordinate development and implementation of beach nesting bird management plans with USFWS, NJDPF and local municipalities.
    - DFW to work with the USFWS and the USACE, to ensure that beachfill and beach renourishment projects include a beach nesting bird component.
    - DFW, USFWS, USACE, NJ-OCE, DEP's Land Use Regulation Program (LURP), and USDA–Natural Resources Conservation Service (NRCS) to work together to develop dune management policies and techniques that benefit beach nesting birds, while still providing adequate storm protection.
    - Where feasible, continue to shift some responsibilities for management of beach nesting birds to individual municipalities and other agencies (e.g., NJDPF at Island Beach State Park).
    - DFW and conservation organizations to work with appropriate local, county, and state road departments to reduce road mortality to northern diamondback terrapins, in particular in areas identified as having high density populations or high incidence of mortality.
    - DFW to continue protection measures for northern diamondback terrapins by requiring excluders on commercial crab traps in small creeks and lagoons.

  - DFW and local municipalities to limit public access and disturbance to colonial waterbird breeding colonies, increase presence at beach nesting bird breeding sites, and continue to strongly enforce Sedge Islands Marine Conservation Zone.
  - DFW to work with state and county mosquito commissions to assess the impacts of insecticides and biological controls on critical wildlife, and improve best management practices for marsh management.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration to plan for and assist with emergency oil spill response.
  - DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
  - DFW to work with the Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, conservation organizations, and land stewards to work with NJ Coastal Heritage Trail to develop more wildlife focused trail destinations or viewing areas, and to elevate the importance of eco-tourism.
  - DFW to work with NJDEP-OEC, USACE, and other appropriate agencies to develop and implement best management practices for making dredge spoil deposition sites attractive to breeding, migrating and wintering wildlife.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need, their habitats, the potential harmful effects of disturbance on beach nesting and coastal marsh birds, and the importance of the Atlantic Flyway and its associated migratory stopover sites.
- DFW to work with Ocean County Park System to develop outreach programs and wildlife viewing opportunities.
- DFW and conservation organizations to expand public outreach through on-site programs, programs at the Lighthouse Camp, and colonial waterbird viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, local land trusts, and through mitigation.
- DEP to encourage the use of Landscape Project critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time.
- Monitor efficacy of habitat management, habitat restoration, and invasive species control projects.
- Continue to annually monitor abundance, productivity, distribution, and trends of breeding piping plovers, black skimmers, least terns, common terns, American oystercatchers (beach nesting population only), osprey (biennial), peregrine falcons, colonial waterbirds (biennial), as well as wintering waterfowl and migratory shorebird communities. Conduct threat assessment including factors relating to nest failure and brood loss.
- Collect baseline data (distribution and abundance) for other coastal species, such as marsh birds, migratory songbirds and raptors, northern diamondback terrapins, and coastal mammals including bats.
- Conduct Delphi Process every three to four years to update status of coastal species.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

5. Northern Atlantic Coastal

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

The Northern Atlantic Coastal zone spans the eastern edge of northern Ocean County and Monmouth County, encompassing the narrow strip of beach and dunes along the ocean and extending west into the tidal portions of several rivers, including the Metedeconk, Manasquan, Shark, Shrewsbury and Navesink (Figure 9). Nearly the entire strand of beach (excluding portions of the Sandy Hook Unit of Gateway National Recreation Area) is subject to ongoing beach renourishment projects and has a manmade feature (boardwalk, bulkheading, seawall, roadway) directly behind the beach instead of a natural dune system. Sandy Hook, located at the northernmost tip of the coast, still has a largely intact vegetated dune community, scrub-shrub and natural beach habitat. The zone also includes the northern section of Barnegat Bay and its adjacent tidal salt meadows and marshes, shallow inlets and coves, upland pitch pine and oak forests. With the exception of the Barnegat Bay portion, the northern coastal zone is distinctly different from coastal zones to the south because of the lack of barrier islands – most of the northern coast is not separated from the mainland (Piedmont Plain) by a body of water.

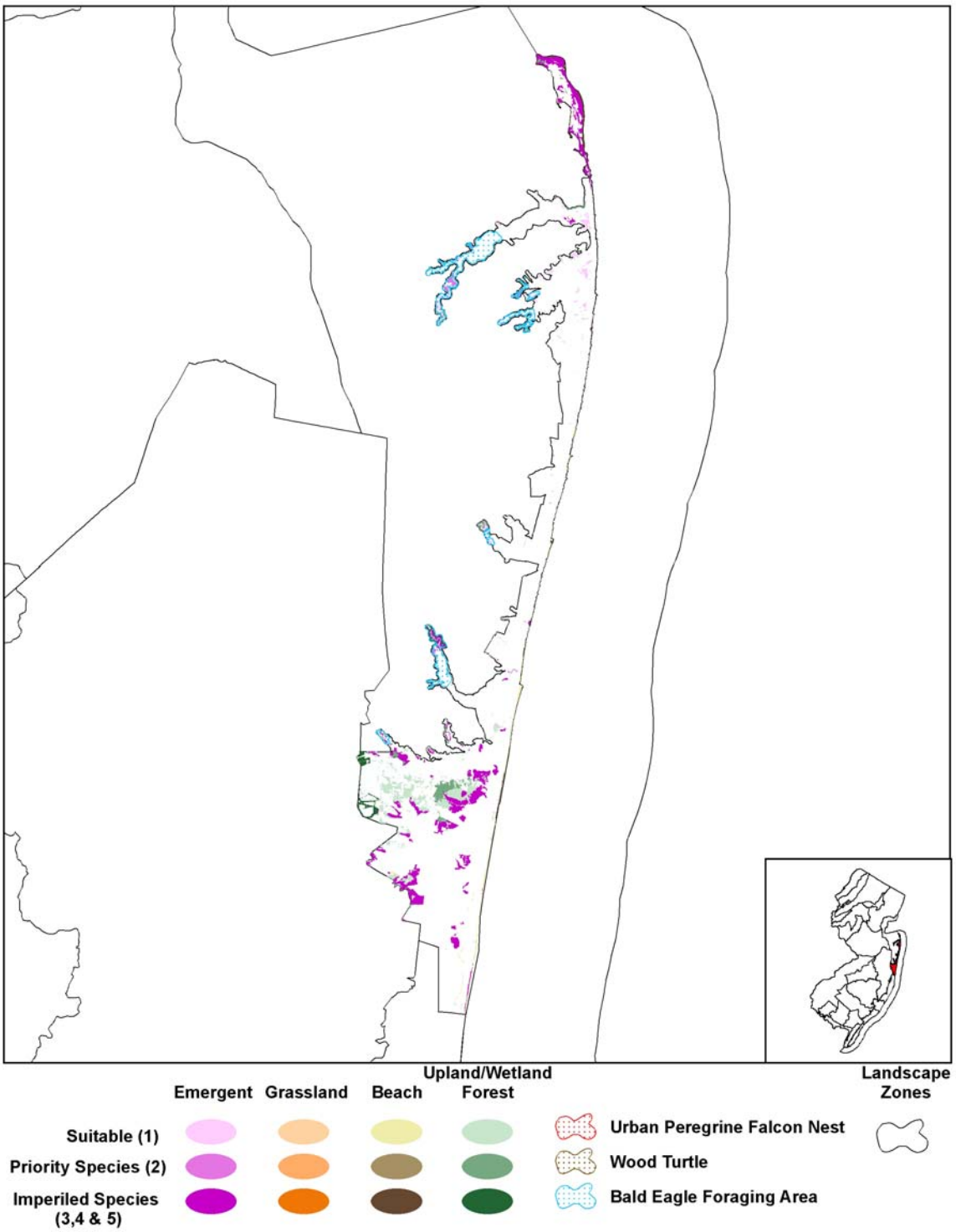
The most important conservation area of opportunity in the Northern Atlantic Coastal zone is the Sandy Hook Unit of Gateway National Recreation Area (including the "resident" U.S. Coast Guard Base). Other important areas include isolated bayside sections of the Edwin B. Forsythe NWR (Barnegat Division), primarily in the vicinity of the Metedeconk River, Swan Point Natural Area, and a portion of the Manasquan River WMA. Several county parks, including Cattus Island and Gull Island in Ocean County and Seven President's Oceanfront Park in Monmouth County, provide habitat for a variety of coastal species. Wetlands and islands within all of the major river systems also provide valuable foraging or nesting habitat for a variety of species.

The beach/dune and coastal wetland/waterways habitats are the priority habitats in the coastal landscape region. Coastal wetlands and their associated waterways support the greatest diversity of species of conservation concern, whereas the beaches and dunes provide habitat for some of the state's most critically threatened species. These habitats are the most representative of the region and because of the intensive recreational usage within these habitats they should receive priority conservation status. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority within this region, although they still provide critical habitat for migratory birds, butterflies, and other species. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this region.

b. Wildlife of Greatest Conservation Need

The Northern Atlantic Coastal zone supports nine federal endangered or threatened species, five state endangered species, four state threatened species, and 41 species of special concern or regional priority. The federal endangered or threatened species are the piping plover, bald eagle,

Figure 9. Critical landscape habitats within the Northern Atlantic Coastal conservation zone, as identified through the Landscape Map (v2).



northeastern beach tiger beetle (reintroduction candidate), as well as sea turtle species that may enter the region's inlets, bays and rivers. In addition, summer populations of bats, potentially including the federal endangered Indiana bat, are suspected to occur in the zone. The five state endangered species are the American bittern, black skimmer, least tern, northern harrier, and peregrine falcon. The four state threatened species are the black- crowned night-heron, osprey, red knot, and yellow-crowned night heron. Among the special concern wildlife are American oystercatchers, common terns, various species of herons and egrets, northern diamondback terrapins, and Fowler's toads. Back-bay salt marshes and coastal sounds in this area are important wintering areas for Atlantic brant and American black ducks in the Atlantic Flyway. Waters of the Navesink and Shrewsbury rivers are significant wintering areas for greater and lesser scaup. Other game species, most notably selected waterfowl species, have been assigned priority status.

The beaches of Sandy Hook provide important nesting habitat for piping plovers, least terns, common terns, and American oystercatchers, foraging habitat for migrating shorebirds, and habitat for reintroduction of northeastern beach tiger beetles. Sandy Hook also provides nesting habitat for ospreys and its scrub-scrub and maritime forest provides critical stopover and foraging habitat for migrating songbirds and raptors. Marsh islands in the northern Barnegat Bay provide nesting habitat for black skimmers and common terns, as well as some colonial waterbirds. Peregrine falcons utilize man-made towers erected along Barnegat Bay for nesting, and although not a confirmed breeder in the northernmost portion of the zone, they have been regularly observed during the breeding season. Tidal portions of the rivers provide nesting and/or foraging habitat for bald eagles and ospreys, as well as habitat for northern diamondback terrapins. Marine mammals, sea turtles, and some species of anadromous fish sometimes utilize estuarine habitat, including inlets, bays, and rivers. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Northern Atlantic Coastal Zone

Table C37. Federal Endangered and Threatened Species*

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Birds				
Piping plover		X		
Reptiles				
Green sea turtle♦	X			
Hawksbill sea turtle♦	X			
Kemp's ridley sea turtle♦	X			
Leatherback sea turtle♦	X			
Loggerhead sea turtle♦	X			
Insects				
Northeastern beach tiger beetle		R		

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦ Sea turtles only present in water (inlets, bays, estuaries).
R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table C38. State Endangered Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American bittern			X	
Bald eagle			X	X
Black skimmer		X	X	
Least tern		X		
Northern harrier			X	X
Peregrine falcon			X	

X: Species occurs within the identified habitat.

Table C39. State Threatened Species

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
Black-crowned night heron			X	X
Osprey		X	X	
Red knot		X	X	
Yellow-crowned night heron			X	X

X: Species occurs within the identified habitat.

Table C40. Nongame Species of Conservation Concern

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
Harbor porpoise	X			
Harbor seal♦	X	X		
Marsh rice rat			X	
Southern bog lemming			X	X
Birds				
American golden-plover			X	
American oystercatcher		X	X	
Black tern		X		
Caspian tern		X		
Cattle egret			X	
Chimney swift				X
Common barn owl				X
Common tern		X	X	
Glossy ibis			X	
Great blue heron				X
Great crested flycatcher				X
Great egret			X	
Greater yellowlegs			X	
Green heron			X	X
Gull-billed tern		X	X	
Horned lark		X		
Hudsonian godwit			X	
Least bittern			X	
Little blue heron			X	
Marbled godwit			X	
Marsh wren			X	
Nelson's sharp-tailed sparrow			X	
Purple sandpiper		X		
Royal tern		X		
Ruddy turnstone		X	X	
Saltmarsh sharp-tailed sparrow			X	
Sanderling		X	X	
Seaside sparrow			X	
Semipalmated sandpiper		X	X	
Snowy egret			X	
Tricolored heron			X	
Whimbrel			X	
Willet		X	X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Bird (continued)				
Wilson's phalarope		X	X	
Reptiles				
Northern diamondback terrapin		X	X	
Amphibians				
Fowler's toad		X		
Fish				
Atlantic sturgeon	X			

♦Harbor seal primarily present in water, but utilize beach as "haul-outs".
X: Species occurs within the identified habitat.

Table C41. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Birds				
American black duck	X		X	
Atlantic brant	X		X	
Black scoter	X			
Bufflehead	X		X	
Canada goose (Atlantic population)	X		X	
Canvasback	X		X	
Clapper rail			X	
Common eider *	X			
Greater scaup	X		X	
Harlequin duck*	X			
Lesser scaup	X		X	
Long-tailed duck	X			
Northern pintail	X		X	
Surf scoter	X			
Virginia rail			X	
White-winged scoter	X			

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
X: Species occurs within the identified habitat.

Table C42. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table C43. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Beach	Wetlands	Forests and Forested Wetlands
Mammals				
River otter	X		X	
Birds				
Sora rail			X	

X: Species occurs within the identified habitat

c. Threats to the Wildlife and Habitats

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Lack of suitable beach habitat limits opportunities for beach nesting birds except in the northernmost portion of this zone, and intensive dune management, including overuse of dune fencing and unnecessary beach grass planting (i.e. where adequate storm protection already exists), further reduces habitat suitability. Mechanical beach raking on virtually all beaches (exceptions: National Guard Training Center, portions of the Boroughs of Monmouth Beach and Sea Bright and Gateway National Recreation Area - Sandy Hook Unit) reduces available foraging habitat for piping plovers and migratory shorebirds and poses risks to unfledged piping plover and least tern chicks. The coastal zone is nearly completely developed, except for some critical areas along the rivers and at Sandy Hook, resulting in little remaining scrub-shrub and forested habitat critical for migratory raptors, songbirds and butterflies, as well as nesting colonial waterbirds. Invasive plant species, including phragmites, which reduce the suitability of wetland habitat, and Japanese sedge, which severely impairs natural communities and desirability of beach and dune habitat, are a threat throughout the region.

Beach nourishment projects create otherwise suitable habitat in areas of high human use, increasing impacts of human disturbance on beach nesting birds. Intensive recreational use of virtually all beaches (with the exception of portions of Gateway National Recreation Area – Sandy Hook Unit and Borough of Sea Bright) severely impacts nesting success for beach nesting birds and also creates disturbance to a wide range of migrating shorebirds. Lax enforcement of local "no-dogs-on-beach" ordinances on nearly all beaches creates severe disturbance of beach nesting birds, with resultant impacts on nesting success. Boats and personal watercraft disturb at back-bay and river colonial waterbird colonies and osprey nests, and interfere with foraging throughout the region. The impacts of aquaculture, particularly for hard clams (*Mercenaria mercenaria*) as well as hydraulic crab dredging, are largely unmeasured and poorly understood.

Excessive predation, especially by human subsidized species (e.g., red fox, crow, gull species, raccoon, striped skunk, free-roaming "owned" or feral cats), severely impairs beach nesting bird and colonial waterbirds breeding success. Because there are no barrier islands to impede mammalian predator access to beach areas and because much of this zone is a year-round residential area, human-induced predator effects are particularly acute in this zone. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, enhance, and/or restore critical habitats identified by the Landscape Project, focusing primarily on habitat for beach dependent species such as piping plover, least tern, black skimmer, and migratory shorebirds (e.g., red knots). The beach/dune habitat is one of two priority habitat types in this zone.

- Identify, protect, enhance, and/or restore suitable coastal wetlands and waterways for wildlife species of conservation concern such as waterfowl, colonial waterbirds (e.g., long-legged, wading birds), secretive marsh birds" (i.e. bitterns, rails), northern diamondback terrapin, and the harbor seal. The coastal wetland/waterways habitats are the second group of priority habitats in this zone.
- Identify, protect, enhance, and/or restore suitable forest and wetland forest habitat for wildlife species of conservation concern, particularly for raptors, forest-dwelling bats, and yellow- and black-crowned night herons. Forest/forested wetlands are also of secondary importance and would receive the lowest priority within this zone.
- Identify, protect, enhance, and/or restore suitable scrub-shrub habitat (areas with >25% woody vegetation <15 feet in height, including late successional back dune vegetative communities, often characterized by presence of bayberry) for wildlife species of conservation concern, particularly migratory songbirds, raptors, butterflies, and other species. Coastal scrub-shrub, including some vegetated dune communities, are of secondary priority in this zone.
- Protect and enhance water quality to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Continue to monitor and protect osprey and peregrine falcon.
- Inventory, determine distribution, and monitor endangered, threatened, special concern, and regional priority wildlife and fish species in the Northern Atlantic Coastal Zone.
- Prevent, stabilize, and reverse declines of endangered, threatened, and rare species and special concern fishes.
- Protect beach nesting bird sites and associated foraging habitats from human disturbance, predation, and other threats.
- Reduce the impacts of human disturbance, predation, and other threats on colonial nesting birds.
- Assess large-scale habitat change (every five to 10 years) focusing on beach erosion and loss of coastal marshes and coastal bay islands.
- Protect and enhance important and unique natural communities.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Atlantic Coastal Regional Landscape stakeholders during a meeting held on March 29, 2007 (see *Attachment H*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical beach/dune, coastal scrub-shrub, forest, and wetland habitats and assess their condition for nesting, migrating, and wintering birds, and other coastal species. Take action to minimize habitat loss by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or habitat management plans. Maintain information and incorporate all new survey and mapping data into the Landscape Project and Biotics database. *(Protect habitat – Landscape Project)*
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify areas where additional habitat-based regulatory measures or land acquisition would be appropriate to benefit wildlife species of conservation concern.
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Develop, implement, and evaluate best management practices to protect, enhance, and restore upland habitat to maintain the migration of raptor (with a main focus on osprey and peregrine falcon) and passerine populations (with a focus on scrub-shrub inhabitants) at viable levels. Develop an action plan for immediate implementation should habitat levels fall below the minimum necessary to sustain the migration. Actively manage state and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*

Priority	Conservation Actions (continued)
Protect critical beach habitat for wildlife species of conservation concern	
1º	Work with the U.S. Army Corps of Engineers (USACE) and the NJDEP Office of Construction and Engineering (OCE) to integrate designs into beach nourishment projects that increase availability of and access to nesting and foraging habitat for beachnesting birds. *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs) for dune management policies, to incorporate into beach nesting bird management agreements, through collaborative efforts with the U.S. Department of Agriculture (USDA) – Natural Resources Conservation Services (NRCS), U.S. Fish and Wildlife Service (USFWS), USACE, and NJDEP LURP. *(Other practices – land management; Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Investigate the efficacy of experimental techniques (e.g., restoration, enhancement) to improve foraging habitat for beachnesting birds. *(Conserve wildlife – rare wildlife)*
Protect critical coastal wetland habitat and waterways for wildlife species of conservation concern	
1º	Work with NJDEP-OCE, USACE, and other appropriate agencies to coordinate beneficial placement of dredge materials for creation, enhancement, or maintenance of colonial waterbird nesting. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Develop, implement, and evaluate best management practices for making dredge spoil deposition sites attractive to breeding, migrating, and wintering wildlife. *(Conserve wildlife – rare wildlife; Other practices – land management)*
2º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Reestablish/restore historically important submerged aquatic vegetation beds to benefit waterfowl species. *(Conserve wildlife – game species)*
2º	Protect overwintering colonies and/or "haul out" areas for harbor seals by using GIS measures, other remote sensing tools, and surveys to identify important "haul-out" areas and post them to minimize human disturbance. *(Protect habitat – humans)*
Protect critical forest and forested wetland habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining forest parcels; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.

Priority	Conservation Actions (continued)
Protect critical scrub-shrub habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify remaining parcels of scrub-shrub habitat; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.
Protect and enhance water quality	
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. Seek appropriate classifications for stream segments based on Index of Biotic Integrity (IBI) results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
2º	Protect water quality through the enforcement of Clean Vessel Act regulations. Boaters to observe pump-out and no discharge zone designations. *(Protect habitat – rare wildlife, fish)*
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Enhance or restore habitats for colonial waterbirds through the elimination or reduction of phragmites from dredge material sites to allow for the natural succession of woody habitats to benefit nesting long-legged wading birds or the creation of sandy substrate for ground nesting colonial waterbirds at selected sites. Restoration efforts should focus on historic dredge material sites, so as to not further reduce the available locations for sediment deposit. If an active site is selected for restoration, efforts should be focused on areas that will not interfere with the sites' capacity to accept sediment. "Jump-start" natural vegetation (using nursery stock and seedlings) where appropriate. *(Conserve wildlife – rare wildlife, invasives)*
1º	Develop, implement, and evaluate best management practices to address adverse effects of invasive plant and wildlife species (e.g. phragmites, mute swan) and over-abundant native wildlife (e.g. resident Canada geese, greater snow goose) on the quality of coastal wetland habitat, including coastal ponds. *(Conserve wildlife – invasives; Other practices – land management)*

Priority	Conservation Actions (continued)
2º	Assess impacts of gull populations (laughing gull, greater black-back gull, herring gull) on the breeding success of beach nesting birds, colonial waterbirds, and other species to determine if integrated wildlife damage management of gulls is necessary. *(Conserve wildlife – invasives)*
2º	Monitor encroachment of Japanese sedge in beach/dune habitat, assess impacts on habitat quality, implement control efforts (e.g., herbicide and physical removal of plants) where appropriate, and research additional control methods. *(Evaluate restoration – invasives)*
2º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the level of potential impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
2º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for species of conservation concern. *(Conserve wildlife – invasives)*
Inventory, determine distribution, and monitor wildlife and fish	
1º	Conduct surveys and review existing databases to better identify the migratory songbird species using coastal habitat and the distribution of the species. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
1º	Conduct research to quantify the importance of shrub-scrub habitat for migratory songbirds. *(Protect habitat – migratory birds)*
1º	Conduct surveys to determine distribution, population, and habitat use of coastal marsh birds, in particular high marsh specialists, such as northern harriers, black rails, and salt marsh sharp-tailed sparrows. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Research population distribution of northern diamondback terrapins to determine critical areas for protection. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify key road-crossing areas of northern diamondback terrapin and work with appropriate government agencies to install turtle crossing signs and erect turtle barriers or provide safe passage, as appropriate, depending on the habitat and location. *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors - roads)*

Priority	Conservation Actions (continued)
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland and barrier island colonies of colonial waterbirds (not covered by aerial surveys), with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Continue the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring; Protect habitat – migratory birds; Conserve wildlife – game species)*
2º	Continue the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring; Conserve wildlife – game species)*
2º	Conduct baseline inventory of the marsh rice rat, southern bog lemming, and seals and develop long-term monitoring plans to determine each species' population trend. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Investigate home ranges of wintering Atlantic brant in relation to carrying capacity of back-bay habitat for Atlantic brant. *(Conserve wildlife – game species)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans; Corridors – migratory birds)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap and band bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Assess significance of coastal region as an important travel corridor and concentration site for migratory tree-roosting bats through comparative surveys of their distribution through radio-telemetry, acoustical monitoring, mist-netting, and field searches during the migratory season. *(Protect habitat – Landscape Project)*
2º	Research and monitor comparative reproductive success of American oystercatcher and common terns on beach vs. marsh nesting habitat at selected sites, including identification of specific threats. *(Conserve wildlife – rare wildlife)*
2º	Identify and research water quality parameters for various species' populations including but not limited to long-legged colonial waterbirds, osprey, bald eagle, northern diamondback terrapin, and other water-dependent coastal species. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*

Priority	Conservation Actions (continued)
Prevent, stabilize, and reverse declines of wildlife and fish populations	
1º	Reduce deleterious effects of pesticides on coastal species and ecosystems by conducting investigations that assess the impacts of pesticides and biological controls on coastal species, in particular those species dependent on coastal marshes and wetlands. Evaluate and modify best management practices as appropriate. *(Other practices – land management)*
1º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
1º	Improve marsh management techniques to benefit critical wildlife species by conducting critical assessments of the effects of Open Marsh Water Management (near northern end of Barnegat Bay) on wildlife species, in particular high marsh nesting birds and waterfowl. Evaluate and modify best management practices as appropriate. *(Conserve wildlife – rare wildlife, game species; Other practices – land management)*
1º	Develop, implement, and evaluate management actions to enhance populations of special concern and rare fish, and implement adaptive management strategies. *(Conserve wildlife – rare wildlife; Protect habitat - fish)*
1º	Conduct research to assess the potential impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations. Conduct studies and create models to identify migratory routes of and assess the potential impacts of wind turbines, tall buildings, radio towers and other "human-made" tall structures to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans)*
2º	Enhance northern diamondback terrapin populations by closing the harvest season until sustainable population levels are reached. Determine if protective regulations are sufficient, in conjunction with naturally occurring survivorship rates, to reduce mortality in northern diamondback terrapin populations. *(Conserve wildlife – rare wildlife)*
2º	Determine compliance with current crab trap regulations (e.g. turtle excluder devices) and increase enforcement if necessary. *(Conserve wildlife – rare wildlife)*
2º	Increase research efforts on the northern diamondback terrapin, including studies focusing on reproductive success, the effects of predators on productivity and developing sustainable population goals. *(Conserve wildlife – rare wildlife)*
2º	Investigate impacts of aquaculture on waterfowl and other wildlife. Determine relative effects of locations and aquaculture techniques. If possible, develop management actions or aquaculture techniques to minimize impacts. *(Aquaculture – land management; Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
2º	Determine carrying capacity of coastal salt marshes for wintering American black ducks and Atlantic brant to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
2º	Investigate crab dredging impacts on back-bay habitats and wildlife. Determine if any restrictions are necessary to protect wildlife or habitats. If needed, determine the nature of restrictions on dredging activities that will achieve protection. *(Protect habitat – humans)*
2º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Work with USFWS and National Park Service to implement reintroduction of northeastern beach tiger beetles at Sandy Hook Unit of Gateway National Recreation Area. *(Conserve wildlife – rare wildlife)*
2º	Investigate carrying capacity of back-bay habitats for wintering greater and lesser scaup to help inform management actions and priorities. *(Conserve wildlife – game species)*
2º	Investigate the role of locally available contaminants in the ecology of greater and lesser scaup to help inform management actions and priorities. *(Protect habitat – contaminants; Conserve wildlife – game species)*
2º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
Monitor and protect ospreys and peregrine falcons	
1º	Continue monitoring all known pairs of peregrine falcon, including assessment of productivity and threats. Track other regularly observed peregrine falcons to determine new nesting pairs/sites. *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife)*
1º	Continue monitoring osprey, including coast wide survey of population and nesting success on biannual basis, and annual assessment of reproductive success at targeted locations. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Maintain nesting opportunities through repair and replacement of existing man-made structures. Identify where additional nesting structures would be appropriate. *(Conserve wildlife – rare wildlife)*
2º	Continue to monitor fish stocks, in particular menhaden, to determine the effects of reduced or changing prey base on the reproductive success of osprey. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
Protect beach nesting bird sites and foraging habitat	
1º	Develop and implement beach management agreements with municipalities, especially the Boroughs of Sea Bright and Monmouth Beach where significant breeding populations of beach nesting birds are already present. Work with other agencies/landowners (National Guard Training Center, Monmouth County Park System) to ensure that a beach nesting bird component is included in management plans for their beach sites. Monitor and evaluate the success of the agreements and modify as appropriate. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Continue intensive monitoring of populations and reproductive success of beach nesting birds, including piping plovers, least terns, black skimmers, common terns, and American oystercatchers, to determine population trends. *(Monitor wildlife – long-term monitoring, Conserve wildlife – rare wildlife)*
1º	Continue existing management practices that minimize impacts of human disturbance (e.g., fence, post, and patrol nesting sites). Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
1º	Protect beach nesting birds and minimize impacts on their reproductive success by incorporating limits on beach raking practices into beach nesting bird management agreements. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Conduct integrated wildlife damage management at important nesting sites for beach nesting birds. Reduction of fox predation at the Sandy Hook Unit of Gateway National Recreation Area is a top priority, as this site in critical for piping plover recovery in the state. *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce excessive predation on beach nesting birds by working with local municipalities and other landowners to develop policies and/or establish regulations that minimize the impacts of predators (e.g., raccoons, gulls, red fox, feral and free-roaming cats) on beach nesting birds. *(Conserve wildlife – cats, subsidized predators)*
2º	Incorporate enforcement of pet restriction regulations into beach nesting bird plans and agreements. Strengthen law enforcement of no-pet restrictions (e.g., dog ordinances) by state and federal conservation officers and park rangers. *(Protect habitat – humans)*
2º	Increase regular presence of state conservation officers at beach nesting bird sites during the nesting season. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
Reduce negative impacts on colonial nesting birds	
1º	Increase frequency of coast-wide aerial colonial waterbirds surveys to once every other year to better determine population trends and distribution. Continue critical investigation of aerial survey technique through selected "ground truthing" and literature and peer review in order to increase efficacy of survey, minimize surveyor bias and error, and increase accuracy of trend data. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Reduce excessive predation on colonial nesting birds through implementation of integrated wildlife damage management at important nesting sites for colonial waterbirds. *(Conserve wildlife – cats, subsidized predators)*
1º	Reduce watercraft impacts on colonial waterbirds. Use GIS measures, other remote sensing tools, and surveys to identify important foraging areas and habitats and establish, post, and enforce buffers to restrict watercraft and pedestrian use around nesting areas. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans)*
2º	Investigate habitat selection of breeding colonial waterbirds, including use of phragmites. *(Protect habitat – Landscape Project)*
2º	Determine reproductive success of colonial waterbirds at targeted nesting colonies. Identify factors limiting success (e.g., predators and possible effects of contaminants). *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife, contaminants)*
2º	Conduct investigations to establish appropriate buffer sizes to minimize disturbance from watercraft and pedestrians at colonial bird nesting sites. *(Protect habitat – humans)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion. Focus within this zone should be on beach erosion and loss of coastal marshes and coastal bay islands.
Protect and enhance important and unique habitats	
1º	Protect and preserve critical habitats and their associated wildlife at Gateway National Recreation Area - Sandy Hook Unit from pressures of heavy recreational usage and redevelopment plans through close coordination with National Park Service and other agencies (i.e. USFWS) or partners in the development of a comprehensive natural resource management plan and other policies that promote the significant importance of this site for wildlife.

Priority	Conservation Actions (continued)
Promote public education and awareness	
1º	Create viewing opportunities for beach nesting birds at Sandy Hook Unit of Gateway National Recreation Area, and for colonial water birds at selected appropriate locations. Develop and install interpretive signage at wildlife viewing locations. *(Education – humans)*
1º	Develop and present educational programs to local environmental organizations, community groups, schools, and the general public to promote understanding of threats to beach nesting birds, colonial water birds, ospreys, and for other coastal species as needed, and to increase environmental stewardship. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*
1º	Develop targeted outreach brochures for pet owners to reduce the negative impacts to beach nesters and migratory and breeding shorebirds from domestic dog activity and free-roaming cats. *(Education – humans)*
1º	Develop a brochure and/or poster which targets boat and jet-ski operators in order to help minimize their impact on wildlife. The outreach materials should include general information about what wildlife may be encountered, and the proper etiquette and appropriate practices for operating watercraft in the vicinity of wildlife and/or areas posted to protect wildlife. *(Education – humans)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop and encourage opportunities for eco-tourism in the coastal zone including but not limited to the creation of viewing opportunities, interpretive trails, and other wildlife viewing experiences. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Develop an outreach brochure about northern diamondback terrapin biology, behavior, and threats, specifically targeting recreational (crab pot) crabbers that can be distributed when they are applying for their crabbing licenses. *(Education – humans)*
2º	Provide public education and outreach efforts focused on NJ's Clean Marina Program and encourage marina owners, boaters, etc. to adopt voluntary practices aimed at preventing adverse impacts to water quality. *(Education – humans)*
2º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, backyard habitat management, and Citizen Science Program. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Work with private landowners to maintain or create scrub-shrub habitat for migratory songbirds, raptors and butterflies through promotion of "backyard habitat" program.
- Encourage private owners of dredge material islands to create or enhance habitat suitable for colonial nesting birds through landowner incentive programs.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.

Public

- Expand volunteer Citizen Scientist Program recruitment and activities.
  - Collaborate with conservation groups such as NJ Audubon Society, local land trusts, The Nature Conservancy–NJ Chapter, and NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
  - Recruit Citizen Scientists and conservation groups to assist with surveying and monitoring of wildlife, including colonial waterbirds, ospreys, peregrine falcons, and migratory shorebirds and songbirds.
  - Involve Citizen Scientists in management and protection projects, such as fencing beach nesting bird breeding sites, erection and placement of osprey nesting platforms, and other appropriate projects.

Wildlife Professionals

- Collaborate with researchers and wildlife managers from other Atlantic coast states to develop best management practices, conservation plans, and surveying protocol for colonial waterbirds, beach nesting birds, and other coastal species.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Elicit assistance from New Jersey Audubon Society (Sandy Hook Bird Observatory and membership in general), in particular through coordinated Citizen Scientist Program, to assist in various bird surveys.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds of conservation need.
- Work with conservation organization such as New Jersey Audubon Society (especially Sandy Hook Bird Observatory), Monmouth County Audubon Society, American Bird Conservancy, and Cats Indoors! to develop advocacy for appropriate conservation and regulatory issues.
- Continue to work with the Wreck Pond Watershed Association to gain assistance with beach nesting bird management and to assist with outreach and advocacy efforts in the local communities.

- Encourage the use of Landscape Project critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres and local land trusts.

Academic Institutions

- Collaborate with Richard Stockton College's Coastal Research Center to develop comparisons of manipulated and natural beach systems that can be used to develop a scientific model to identify suitable beach nesting bird micro-habitats, which can be incorporated into beach fill project designs.
- Continue Monmouth University Intern Program to assist in management and protection of beach nesting birds in the Monmouth County region.
- Work with Rutgers University to develop appropriate graduate level research projects in the coastal area, in particular focusing on beach nesting birds and colonial waterbirds.
- Work with Rutgers University Center for Remote Sensing and Spatial Analysis to develop predictive modeling and GIS mapping of areas that will be potentially impacted by sea-level rise.
- Collaborate with other US and Canadian universities on migration and wintering ecology of waterfowl and other birds of conservation need.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USFWS - NJ Field Office, US Army Corps. of Engineers (USACE), USDA, non-profit organizations, Department of Community Affairs (DCA), and Office of Smart Growth to protect, enhance, and create habitats and to protect populations of coastal species.
    - Municipalities, NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) and Parks and Forestry (DPF), the State Wildlife Control Unit, USDA-APHIS-Wildlife Services, and local animal control officers to work together to reduce the effects of predators, especially red foxes and feral cats, on beach nesting birds and other critical wildlife.
    - DFW and conservation organizations to develop stronger partnerships with municipal environmental commissions to gain support for local conservation efforts, in particular involving beach nesting birds.
    - DFW to coordinate development and implementation of beach nesting bird management plans with USFWS, NJDPF and local municipalities.
    - DFW to work with the USFWS and the USACE, to ensure that beach fill and beach renourishment projects include a beach nesting bird component.
    - Where feasible, continue to shift some responsibilities for management of beach nesting birds to individual municipalities and other agencies, as has already been achieved at Seven President's Oceanfront Park (Monmouth Co. Park System).
    - DFW and conservation organizations to work with appropriate local, county, and state road departments to reduce road mortality to diamondback terrapins, in particular in areas identified as having high-density populations or high incidence of mortality.
    - DFW to continue protection measures for northern diamondback terrapins by requiring excluders on commercial crab traps in small creeks and lagoons.

  - DFW and local municipalities to limit public access and disturbance to colonial waterbird breeding colonies and increase presence at beach nesting bird breeding sites.
  - DFW to work with state and county mosquito commissions to assess the impacts of insecticides and biological controls on critical wildlife, and improve best management practices for marsh management.
  - DFW and conservation organizations to work with Ocean and Monmouth County Park Systems to develop outreach programs, enhance wildlife viewing opportunities, and assist with stewardship of park lands to best benefit wildlife.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration (NRCS) to plan for and assist with emergency oil spill response.
  - DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
  - DFW to work with the Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, conservation organizations, and land stewards to work with NJ Coastal Heritage Trail to develop more wildlife focused trail destinations or viewing areas, and to elevate the importance of eco-tourism.
  - DFW to work with NJDEP-OEC, USACE, and other appropriate agencies to develop and implement best management practices for making dredge spoil deposition sites attractive to breeding, migrating and wintering wildlife.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need, their habitats, the potential harmful effects of disturbance on beach nesting and coastal marsh birds, and the importance of the Atlantic Flyway and its associated migratory stopover sites.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and colonial waterbird viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, local land trusts, and through mitigation.

- DEP to encourage the use of Landscape Project critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time.
- Monitor efficacy of habitat management, habitat restoration, and invasive species control projects.
- Continue to annually monitor abundance, productivity, distribution, and trends of breeding piping plovers, black skimmers, least terns, common terns, American oystercatchers (beach nesting population only), ospreys (biennial), peregrine falcons, colonial waterbirds (biennial), as well as wintering waterfowl and migratory shorebird communities. Conduct threat assessment including factors relating to nest failure and brood loss.
- Collect baseline data (distribution and abundance) for other coastal species, such as marsh birds, migratory songbirds and raptors, diamondback terrapins, and coastal mammals including bats.
- Conduct Delphi Process every three to four years to update status of coastal species.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

6. The Atlantic Ocean

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

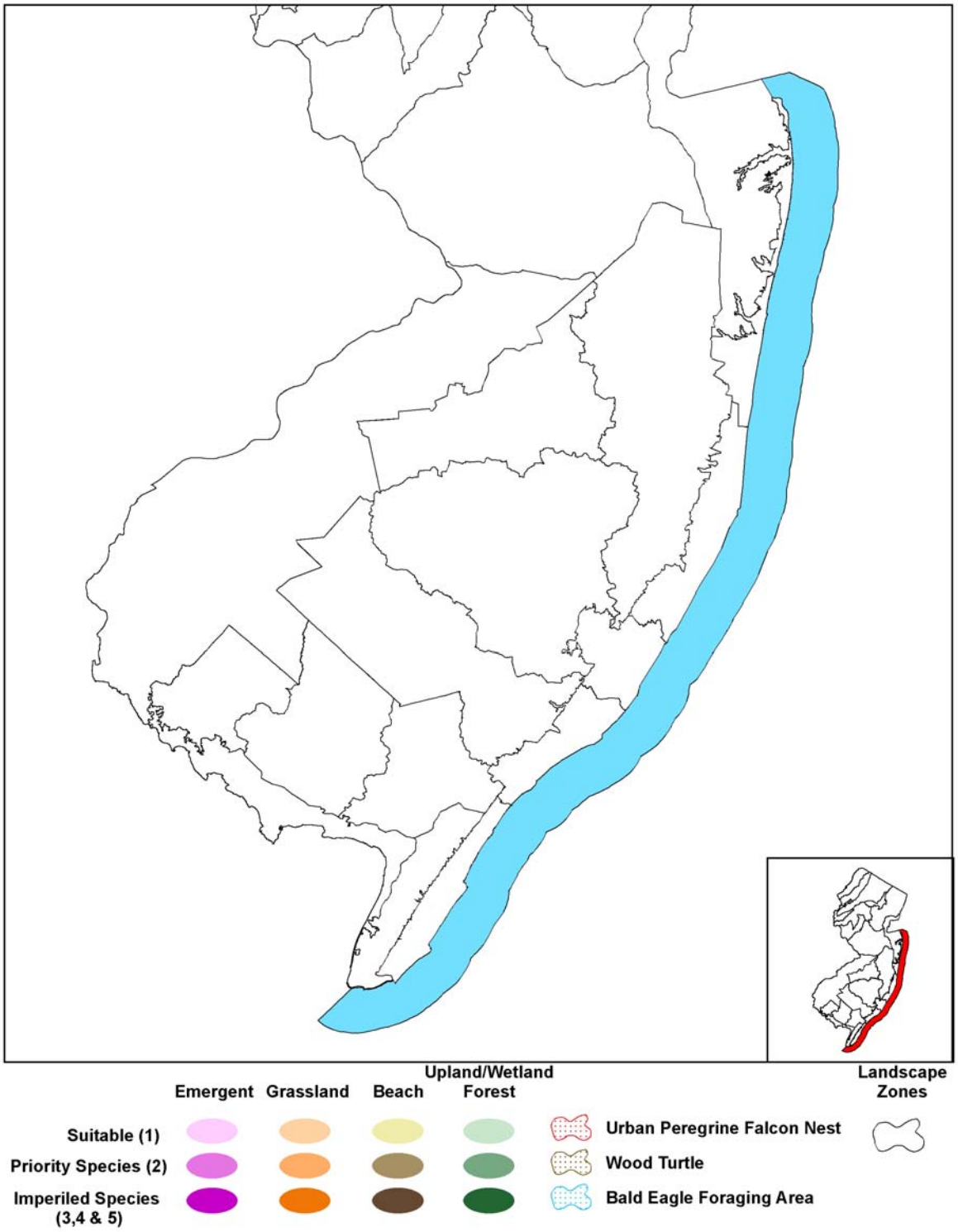
a. Habitats

The Atlantic Ocean is marine habitat extending from the coasts of Monmouth, Ocean, Atlantic and Cape May counties extending out to the 3-mile limit under state jurisdiction (Figure 10).

b. Wildlife of Greatest Conservation Need

The Atlantic Ocean supports 11 federal endangered or threatened species and three suites of special concern or regional priority wildlife. The federal endangered wildlife species include blue, fin, humpback, right, sei, and sperm whales, hawksbill sea turtle, Kemp's ridley sea turtle, green sea turtle, and leatherback sea turtle. Loggerhead sea turtle, which is state endangered, is the federal threatened species. The Atlantic sturgeon is a federal species of concern. Some pinnipeds (harbor seals), porpoises (harbor porpoises), pelagic birds (including true pelagics and near-shore migrants), and anadromous fish species (Hickory shad) are suites of wildlife of special concern or regional priority. Tables C44 – C47 identify the species of greatest conservation need within this zone.

Figure 10. Critical landscape habitats within the Atlantic Ocean conservation zone, as identified through the Landscape Map (v2).



Wildlife Species of the Atlantic Ocean Zone

Table C44. Federal Endangered and Threatened Species*

Common Name	Ocean
Mammals	
Blue whale	X
Fin whale	X
Humpback whale	X
Right whale	X
Sei whale	X
Sperm whale	X
Reptiles	
Green sea turtle	X
Hawksbill sea turtle	X
Leatherback sea turtle	X
Loggerhead sea turtle	X
Kemp's ridley sea turtle	X

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
X: Species occurs within the identified habitat.

Table C45. Nongame Species of Conservation Concern

Common Name	Ocean
Mammals	
Harbor porpoise	X
Harbor seal	X
Birds	
Audubon's shearwater	X
Bridled tern	X
Greater shearwater	X
Horned grebe	X
Manx shearwater	X
Northern gannet	X
Razorbill	X
Red-throated loon	X
Fish	
Atlantic sturgeon	X

X: Species occurs within the identified habitat.

Table C46. Game Species of Regional Priority

Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Ocean
Birds	
Black scoter	X
Common eider*	X
Harlequin duck*	X
Long-tailed duck	X
Surf scoter	X
White-winged scoter	X

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
X: Species occurs within the identified habitat.

Table C47. Fish Species

Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Ocean
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

c. Threats to Wildlife in the Atlantic Ocean

Whale, sea turtle, pinniped, and seabird populations are threatened by many commercial fishing practices, including long lines and gill nets. Sea turtles, pinnipeds and especially whales are susceptible to ship strikes. Atlantic sturgeon are threatened by habitat loss/degradation and commercial fishing practices, such as gillnetting for monkfish and dogfish sharks. Threats to seabirds are less well known as abundance, distribution, and usage patterns within state waters have not been studied extensively. Oil spills, in particular large events which always loom as a threat because of the large amount of oil routinely transported to ports in the Delaware River near Philadelphia and New York Harbor area, have potentially serious short and long-term impacts on all marine species. Proposed offshore wind energy projects may also be a threat to species using the marine environment, in particular seabirds and migratory birds. The impacts of aquaculture, particularly for hard clams (*Mercenaria mercenaria*), as well as hydraulic crab dredging, are largely unmeasured and poorly understood. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Please also refer to the goals and actions identified within the Marine Mammal Workshop report. The report will be available on the NJ Division of Fish and Wildlife's Web site in the near future.
- Inventory, determine distribution, and monitor marine species of conservation concern, primarily marine mammals and sea turtles, and special concern fishes within NJ's waters of the Atlantic Ocean.
- Prevent, stabilize, and reverse declines of endangered, threatened, and rare marine species, primarily marine mammals and sea turtles, and special concern fishes.
- Promote public education and awareness, marine wildlife and indigenous nongame fish species conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Atlantic Coastal Regional Landscape stakeholders during a meeting held on March 29, 2007 (see *Attachment H*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Inventory, determine distribution, and monitor marine species	
1°	Use existing survey data (NJAS SeaWatch, SeaNet Beach Bird Surveys) to develop a database of seabird species (near-shore migrants and pelagic birds) presence and their distribution. Initiate additional survey efforts to gain a better understanding of usage patterns/distribution. *(Monitor wildlife - long-term monitoring)*

Priority	Conservation Actions (continued)
1º	Develop and implement a reliable survey for measuring pelagic bird populations and/or trends of near-shore water birds of conservation need. *(Monitor wildlife - long-term monitoring)*
1º	Conduct surveys in shipping lane vicinities and along the coast during whale migration to determine the seasonal distribution of whales, particularly for right whales. *(Monitor wildlife - long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Use predictive GIS model based on available species occurrence information and habitat data to predict right whale migration routes off the NJ coast and conduct surveys to validate the model. *(Protect habitat – Landscape Project, Conserve wildlife – rare wildlife)*
1º	Determine whale distribution and right whale migration routes through the participation in the East Coast's Sightings Advisory System for mariners. *(Monitor wildlife - long-term monitoring)*
1º	Increase or initiate monitoring programs for marine species of conservation concern as identified within NJ's Wildlife Action Plan where present data is insufficient. *(Protect habitat – Landscape Project)*
2º	Use existing data to develop a database of the Atlantic bottlenose dolphin and harbor porpoise populations' abundance and distribution. *(Monitor wildlife - long-term monitoring)*
2º	Evaluate existing data on the Atlantic bottlenose dolphin and harbor porpoise and initiate regular surveying and/or monitoring, if deemed necessary. *(Monitor wildlife - long-term monitoring)*
Prevent, stabilize, and reverse declines of wildlife and fish populations	
1º	Incorporate the recommendations and needs identified through the Marine Mammal Workshop (held April 17-19, 2006) for the conservation of NJ's marine mammals and sea turtles. *(Conserve wildlife – rare wildlife)*
1º	Develop and implement conservation plans specific to New Jersey waters for whales, pinnipeds, seabirds (consistent with the North American Waterbird Conservation Plan), and sea turtles. *(Conserve wildlife – rare wildlife)*
1º	Work with experts and other government agencies to establish criteria to protect seabird species (near-shore migrants and pelagic birds) through regulatory measures. *(Conserve wildlife – rare wildlife)*
1º	Reduce "by-catch" of listed and other critical species through regulatory or volunteer measures. *(Protect aquatic wildlife – humans)*
1º	Conduct research to assess the potential impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations. Conduct studies and create models to identify migratory routes of and assess the potential impacts of wind turbines, tall buildings, radio towers and other "human-made" tall structures to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect aquatic wildlife – humans)*

Priority	Conservation Actions (continued)
1º	Identify regulations per the Marine Mammal Protection Act (MMPA) currently not being enforced and enforce them. These regulations include but are not limited to restrictions on approach distance to right whales (a minimum 500 yards or 457.2 meters) and all other marine mammals (a minimum of 50 yards or 45.72 meters), and prohibits the harassment, hunting, capturing, and killing of marine mammals. *(Protect aquatic wildlife – humans)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
2º	Conduct literature searches, surveys, and work with marine species researchers along the eastern coast to identify the threats facing whales, pinnipeds, porpoises, and sea turtles including ship strikes and commercial fishing gear. *(Protect aquatic wildlife – humans)*
2º	Assess the threats and determine the health of the Atlantic bottlenose dolphin and harbor porpoise populations through research and from expert opinion. *(Conserve wildlife – rare wildlife)*
2º	Investigate sound sources off the NJ coast to determine the potential acoustical threats to marine mammals. Develop and incorporate a plan into a marine mammal protection strategy, as recommended through the Marine Mammal Workshop (held April 17-19, 2006), to minimize the impacts off the NJ Coast within NJ state waters (3 nautical miles from the coastline). *(Protect aquatic wildlife – humans)*
2º	Develop, implement, and evaluate management actions to enhance populations of special concern and rare fish, and implement adaptive management strategies. *(Conserve wildlife – rare wildlife; Protect habitat - fish)*
2º	Investigate impacts to Atlantic sturgeon from commercial fishing practices and recommend restrictions on fishing gear and locational and/or seasonal restrictions. *(Protect aquatic wildlife – humans)*
2º	Conduct investigations of healthy and stranded marine mammals and sea turtles to determine diet, contaminant loads, general health, and parasite load.
2º	Protect water quality through the enforcement of Clean Vessel Act regulations. Boaters to observe pump-out and no discharge zone designations. *(Protect habitat – rare wildlife, fish)*
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
Assess status of selected marine and estuarine fishes through the Delphi Process	
1º	Prevent declines in marine and estuarine fishes and pelagic bird populations by utilizing the NOAA Proactive Conservation Program's Species of Concern list to inform NJ's Delphi process when determining species that may warrant a state listing of endangered, threatened, or special concern. *(Status – fish; Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
Promote public education and awareness	
1º	Develop educational brochures, posters, and programs (targeted at both children and adults) that convey the threat posed by contaminants and persistent marine debris to marine life. *(Education – humans)*
1º	Develop educational programs and present to schools, local environmental organizations, community groups, and the general public to promote understanding of threats to marine mammals, sea turtles, and other marine species and to increase environmental stewardship. *(Education – humans)*
2º	Develop and maintain educational brochures and posters and potential viewing opportunities of marine mammals and sea turtles for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop and encourage opportunities for Atlantic Ocean wildlife eco-tourism including but not limited to the creation of viewing opportunities, interpretive trails, and other wildlife viewing experiences. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Provide public education and outreach efforts focused on NJ's Clean Marina Program and encourage marina owners, boaters, etc. to adopt voluntary practices aimed at preventing adverse impacts to water quality. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Public

- Expand volunteer Citizen Scientist Program recruitment and activities.
- Recruit volunteers through Citizen Scientist Program or other conservation organizations to participate in the Seabird Ecological Assessment Network's (SEANET) beached bird surveys.
- Identify other projects where Citizen Scientist Program could assist with surveying and monitoring of marine species.

Commercial and Recreational Fishermen

- Enlist the support of commercial and recreational fishermen in identifying whales and pelagic birds in New Jersey waters.
- Enlist commercial and recreation fishermen, along with members of the Garden State Seafood Association, to serve as reviewers in the Delphi Process.

Conservation Organizations

- Work with the Marine Mammal Stranding Center, Riverhead Foundation, and other stranding organizations to participate in marine mammal/sea turtle conservation workshop and identify conservation needs.
- Work with New Jersey Audubon Society to improve our understanding of pelagic bird species, possibly by expanding their current survey efforts of near-shore migrants, which consists of an annual fall survey (from land) at one location. Coordinate efforts to assess threats of wind energy projects.
- Continue to work with the Wildlife Trust (and Tufts University) which has implemented a Seabird Ecological Assessment Network (SEANET) for New Jersey that includes beached bird surveys at targeted locations along the coast, development of a seabird database, and identification of causes of bird mortality.

Academic Institutions

- Work with Rutgers University, including Center for Coastal and Marine Studies, to identify conservation needs and initiate (or continue) research projects as appropriate.
- Work with Rutgers University, Richard Stockton College of NJ and other academic institutions to participate in the marine mammal/sea turtle conservation workshop and identify conservation needs.
- Continue to work with Tufts University (through SEANET) to identify causes of mortality of pelagic seabirds.
- Enlist experts from Rutgers University, Richard Stockton College of NJ and other academic institutions to serve as reviewers in the Delphi Process.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies to protect, enhance, and create habitats and to protect populations of marine mammals, sea turtles, near-shore and pelagic birds, and Atlantic sturgeon.
- NJ Department of Environmental Protection's Division of Fish and Wildlife (DFW), US Fish and Wildlife Service (USFWS)–NJ Field Office, and National Oceanic and Atmospheric Administration (NOAA) Fisheries to work together to implement recovery plans.
- DFW, NOAA Fisheries, and other marine experts to collaborate in a workshop to identify conservation needs of marine mammals, reptiles, birds, and fish.
- DFW to collaborate with USFWS, Atlantic Flyway Council, and Atlantic Coast Joint Venture to develop and implement an operational sea duck and near-shore bird survey for species of conservation need.
- DFW to identify important pinniped areas.
- DFW and NOAA Fisheries to investigate the impacts of fisheries gear interactions (including by-catch) on marine mammals, sea turtles, pelagic birds and Atlantic sturgeon.
- DFW and NOAA Fisheries to determine acoustic threats to marine mammals.
- DFW and the National Marine Fisheries Industry to develop guidelines and/or regulations to reduce by-catch of marine mammal, sea turtles, and pelagic birds.
- DFW to expand efforts to develop materials for eco-tourism.
- DFW and NOAA Fisheries, and Mid-Atlantic Fishery Management Council to conduct Delphi Process.

- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with federal and state agencies, including USFWS, USCG, NOAA, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration, to plan for and assist with emergency oil spill response.

g. Monitoring Success

- Monitor populations and abundance of whales, pinnipeds, sea turtles, and near-shore and pelagic birds of conservation need.
- Determine if by-catch of critical species is reduced.
- Conduct Delphi Process every three to four years to update status of marine species.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

Delaware Bay Landscape

Contents of the Chapter on the Delaware Bay Landscape

This landscape includes Cumberland, Cape May, and southern Atlantic counties and parallels the coastline of the Delaware Bay and the Cape May Peninsula, from Oyster Cove to Great Egg Harbor. The Delaware Bay and the Cohansey, Maurice, and Tuckahoe Rivers are the most prominent aquatic features of this landscape. The region may be divided into five zones: Cohansey River, Maurice River, Tuckahoe River, Delaware Bay shoreline, and Cape May peninsula. The boundaries of these zones were determined first by general habitat types and second by watershed (HUC 14) lines. The shoreline zone was defined to generally follow the woodline between marsh and upland habitats.

A. Ecological Units in the Delaware Bay Landscape

The Delaware Bay Landscape is within the Middle Atlantic Coastal Plain Section and crosses the southern extent of both the New Jersey Inner Coastal Plain (232Ac) and New Jersey Outer Coastal Plain (232Ab) subsections.

B. Geology and Climate

The Delaware Bay Landscape is within the Coastal Plain physiographic province. The landscape gently rises from the Delaware Bay and the Atlantic Ocean coastlines to 36 meters (118 ft.) above sea level. The average temperature across the New Jersey Inner and Outer Coastal Plain subsections is between 10.5 to 12.2ºC (51 to 54ºF) and the growing season varies from 180 to 225 days. The average annual precipitation is between 101.6 and 116.8 centimeters (40 to 46 in.).

C. Habitats

This landscape is bordered on the east by the expansive salt marsh between the mainland and the Atlantic Ocean barrier islands, to the northeast by the Pinelands, and on the west by the Delaware Bay (Figure 11). The upland forests and forested wetlands of the Delaware Bay Landscape (100,886 hectares, 389.5 sq. mi.) include pitch pine, oaks, black cherry, and sweet gum. These forests, particularly in the Cape May peninsula, support the majority of New Jersey's neotropical birds. The wetlands of Delaware Bay (33,897 hectares, 130.8 sq. mi.) include extensive saltwater marshes. The sandy overwash beaches (312 hectares, 1.2 sq. mi.) are a critical stopover for migrating shorebirds. There are agricultural lands as well, producing lettuce, peppers, tomatoes, cabbage, and soybeans on much of the 28,798 hectares (111.1 sq. mi.) of grasslands, which are not necessarily suitable habitats for grassland species. Similarly, scrub/shrub habitat is included in the "forest" and "forested wetlands" habitats on the Landscape Maps. Federal, state agencies, and nonprofit conservation organizations own and manage a large percentage of the Delaware Bay landscape. This region has the highest concentration of rare and endangered wildlife in New Jersey, accompanied by the lowest density of urban development in the state. The Delaware Bay Landscape is a region of global importance and offers considerable opportunities for conservation.

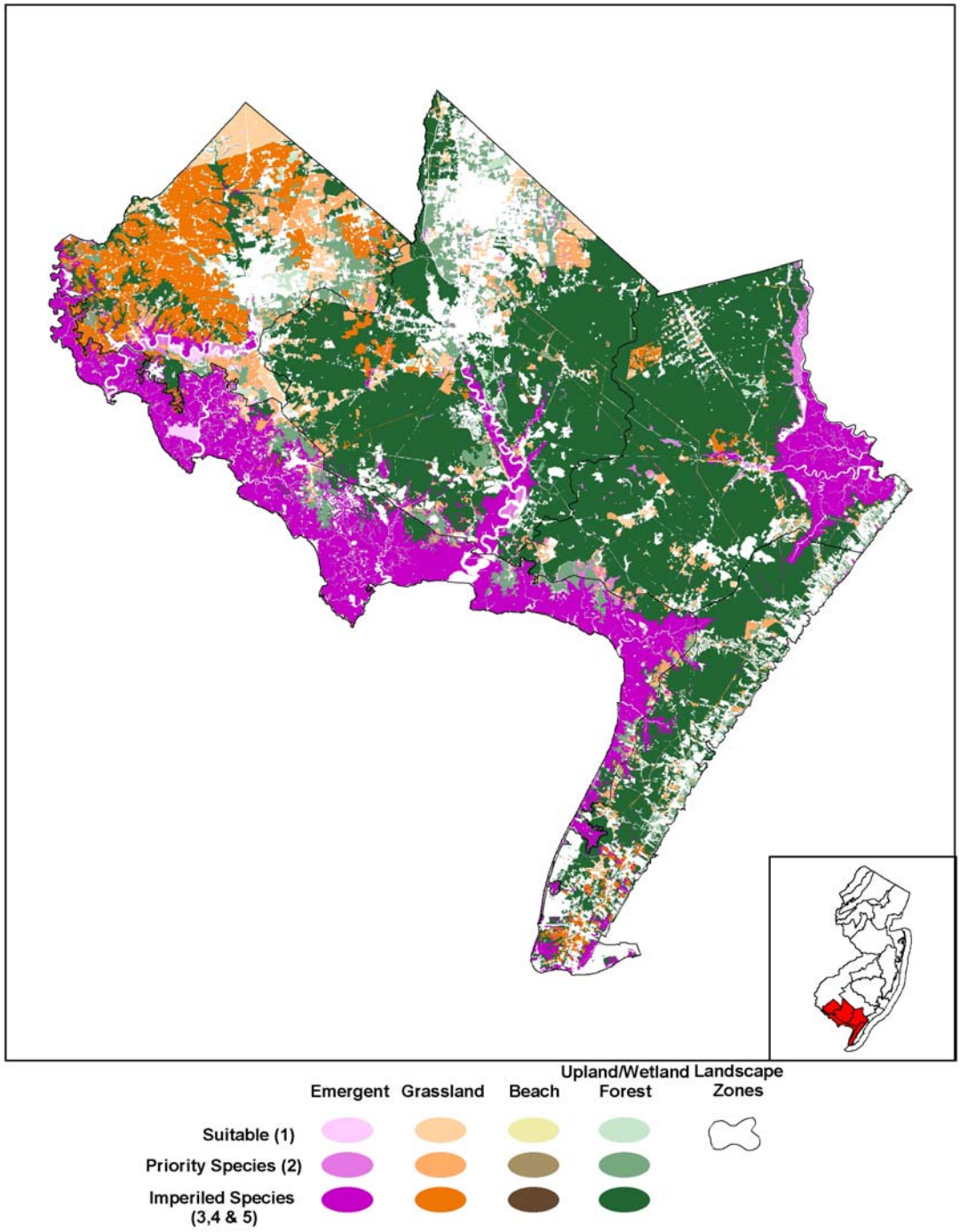
Conservation Zones in the Delaware Bay region are:
(1) Cohansey River
(2) Maurice River Watershed
(3) Tuckahoe River Watershed.
(4) Delaware Bay Shoreline
(5) Cape May Peninsula

D. Wildlife of Greatest Conservation Need

The Delaware Bay Landscape is essential for the viability of national and international bird migrations as well as rare New Jersey wildlife. This region includes the Delaware Bay coast and marshes, critical stopover habitat for Western Hemispheric migratory shorebirds, including red knots, which depend on this coastline and an abundant food supply. This region also includes the Cape May Peninsula, nationally recognized for its high-density migration of passerines, American woodcock, and raptors that are funneled along the Atlantic and Delaware Bay coasts. The Delaware Bay region supports the largest portion of the state's bald eagle population, and has been essential to the recovery of the eagle in the state. The Delaware Bay region is a critical migration and wintering area for American black ducks in the Atlantic Flyway. The marshes of the large rivers of this region support one of the largest fall concentrations of sora in the Atlantic Flyway. The region is crucial to the state's population of eastern tiger salamander, Cope's gray treefrog, northern harrier and black rail. In addition, the region holds some of the state's largest contiguous forest blocks, which support species that depend on unbroken forest habitats – some of the most rare and sensitive species in the state.

Delaware Bay beaches, wetlands, forests, and grasslands support an abundance of rare and migratory wildlife. Included are federally-listed aquatic species (sea turtles and shortnose sturgeon) marginally supported in this region. There are 13 state endangered, 14 state threatened, and 128 special concern and regional priority wildlife species. The bald eagle, black skimmer, Henslow's sparrow, least tern, northern harrier,

Figure 11. Critical landscape habitats within the Delaware Bay Landscape and associated conservation zones as identified through the Landscape Map (v2).



peregrine falcon, red-shouldered hawk, short-eared owl, sedge wren, vesper sparrow, corn snake, Cope's gray treefrog, eastern tiger salamander, and bronze copper are the state endangered wildlife in the Delaware Bay Landscape. State threatened wildlife include the barred owl, black rail, black-crowned night-heron, bobolink, Cooper's hawk, grasshopper sparrow, long-eared owl, osprey, red knot, red-headed woodpecker, savannah sparrow, northern pine snake, Pine Barrens treefrog, and frosted elfin. Special concern wildlife include cavity-nesters, coastal marsh birds, colonial waterbirds, forest passerines, grassland birds, and scrub-shrub/open field birds; northern diamondback terrapins, carpenter frogs, and other reptiles and amphibians. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, occur in the Delaware Bay.

The following tables list the wildlife of greatest conservation need, the suites of wildlife, and the conservation opportunity areas to conserve them in the Delaware Bay Landscape. The wildlife are prioritized by federal endangered and threatened, state endangered, state threatened, and special concern and regional priority status.

Prioritized List of the Wildlife of Greatest Conservation Need and their Location in the Delaware Bay Landscape

Table DB1. Federal Endangered and Threatened Species*

Common Name	Federal Status & Regional Priority	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Mammals						
Indiana bat	E		R**	R**		
Reptiles						
Green sea turtle	T				I	
Leatherback sea turtle	E				I	
Loggerhead sea turtle	T				I	
Bog turtle	T	R				
Hawksbill sea turtle	E				I	
Kemp's ridley sea turtle	E				I	
Fish						
Shortnose sturgeon	E & RP				R	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
T: Federally threatened species.
E: Federally endangered species.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table DB2. State Endangered Species

Common Name	Regional Priority	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Mammals						
Bobcat			R	R		
Birds						
American bittern	RP	R	R	R		
Bald eagle	T	I	I	I	I	I
Black skimmer	RP				R	
Henslow's sparrow	RP	R				
Least tern	RP		M		I	
Loggerhead shrike	RP	R				R

State Endangered Species (continued)

Common Name	Regional Priority	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Birds (continued)						
Northern harrier		I	I	I	I	I
Peregrine falcon			M	M	M	M
Pied-billed grebe	RP					I
Red-shouldered hawk		I	I	I		I
Sedge wren	RP				I	
Short-eared owl	RP				I	
Vesper sparrow		I	I			
Reptiles						
Corn snake			I			
Timber rattlesnake			R	R		
Amphibians						
Cope's gray treefrog		M	I	I		I
Eastern tiger salamander			I	I		I
Insects						
Bronze copper		I	I			

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table DB3. State Threatened Species

Common Name	Regional Priority	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Birds						
Barred owl		I	I	I		I
Black rail	RP		I		I	
Black-crowned night-heron	RP		I	I	I	I
Bobolink	RP	I	M			
Cooper's hawk	RP	I	I	I		I
Grasshopper sparrow	RP	I	M			
Long-eared owl			R	I		
Osprey		I	I	I	I	I
Red knot	RP		I	I	I	I
Red-headed woodpecker	RP	I	I	I		I
Savannah sparrow		I	M			
Yellow-crowned night heron	RP			R	R	R
Reptiles						
Northern pine snake			I	I		I
Amphibians						
Pine Barrens treefrog			I	I		I
Insects						
Frosted elfin			I	I		I

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table DB4. Nongame Species of Conservation Concern

Common Name	Conservation Status	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Mammals						
Eastern red bat	RP	R**	R**	R**		R**
Eastern small-footed myotis	S1, G3	R**	R**	R**		R**
Hoary bat	RP	R**	R**	R**		R**
Marsh rice rat	S3, G5				R	
Silver-haired bat	RP	R**	R**	R**		R**
Southern bog lemming	S2, G5		R	R		

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Birds						
Acadian flycatcher	RP	M	M	M		M
American golden-plover	RP					
American kestrel	SC/RP	I	I	I		I
American oystercatcher	SC/RP		M	M	M	M
Baltimore oriole	RP	I		I		I
Black tern	SC/RP				M	
Black-and-white warbler	RP	I	I	I		I
Black-billed cuckoo	RP	I	I	I		I
Black-throated green warbler	SC		I			
Blackburnian warbler	RP		M	M		M
Blue-winged warbler	RP	I	I	I		I
Broad-winged hawk	SC/RP	M	M	M		M
Brown thrasher	RP	I	I	I		I
Canada warbler	SC/RP		M	M		
Cattle egret	RP			M		M
Chimney swift	RP	I	I	I		I
Chuck-will's-widow	RP	I	I	I		I
Common barn owl	SC	I	I	I	I	I
Common nighthawk	SC		I	I		I
Common tern	SC/RP			I	I	I
Dickcissel	RP	I				
Eastern kingbird	RP	I	I	I		
Eastern meadowlark	SC/RP	I	M	M		M
Eastern screech-owl	RP	M	M	M		M
Eastern towhee	RP	I	I	I		I
Eastern wood-pewee	RP	I	I	I		I
Field sparrow	RP	I	M	M		M
Forster's tern	RP			M	M	M
Glossy ibis	RP			M	I	M
Gray catbird	RP	M	M	M		M
Great blue heron	SC/RP	M	M	M	M	M
Great crested flycatcher	RP	I	I	I		I
Great egret	RP	M	M	M	M	M
Greater shearwater	RP					
Green heron	RP		M	M	M	M
Horned grebe	RP					
Hooded warbler	RP		M	M		M
Horned lark	SC	I				
Indigo bunting	RP	I	I	I		I
Kentucky warbler	SC/RP	I	I	I		I
King rail	SC/RP		M	M	M	M
Least bittern	SC/RP	M	M	M	M	M
Little blue heron	SC/RP		M		M	M
Louisiana waterthrush	RP	M	M	M		M
Mallard	RP	M	M	M	M	M
Marsh wren	RP	M	M	M	M	M
Northern flicker	RP	I	I	I		I
Northern gannet	RP					
Northern parula	SC		M	M		M
Pine warbler	RP	M	M	M		M
Prairie warbler	RP	I	I	I		I
Prothonotary warbler	RP	I	I	I		I
Razorbill	RP					
Red-throated loon	RP					
Rose-breasted grosbeak	RP			I		
Ruddy turnstone	RP		I		I	
Saltmarsh sharp-tailed sparrow	RP		I	I	I	I
Sanderling	SC/RP				I	
Scarlet tanager	RP	I	I	I		I
Seaside sparrow	RP	M	M	M	M	M

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Birds (continued)						
Semipalmated sandpiper	RP		I		I	
Sharp-shinned hawk	SC/RP		M	M	M	M
Snowy egret	SC/RP		M	M	I	M
Spotted sandpiper	SC		M	M		
Tricolored heron	SC/RP				I	M
Veery	SC		I	I		
Whip-poor-will	RP	I	I	I		I
Willet	RP		M	M	M	M
Willow flycatcher	RP	I	I	I		I
Wood thrush	RP	I	I	I		I
Worm-eating warbler	RP		M	M		M
Yellow-billed cuckoo	RP	I	I	I		I
Yellow-breasted chat	SC/RP	I	I	I		I
Yellow-throated vireo	RP	I	I	I		I
Yellow-throated warbler	RP	M	M	M		M
Reptiles						
Eastern box turtle	SC	M	M	M		M
Eastern kingsnake	SC	M	M	M		M
N. diamondback terrapin	SC		I	I	I	
Spotted turtle	SC	M	M	M		M
Amphibians						
Carpenter frog	SC	M	M	M		M
Fowler's toad	SC	M	M	M		M
Marbled salamander	SC	M	M	M		M
Insects						
Dotted skipper, *Hesperia attalus*	SC		M			
Hessel's hairstreak, *Callophrys hesseli*	SC	M	M			
A geometrid moth, *Eusarca fundaria*	S2S3, G4				X	
A geometrid moth, *Idaea violacearia*	S1S3, G4		X			
A geometrid moth, *Metarranthis sp 1*	S2, G3		X	X		
A noctuid moth, *Apamea inebriata*	S2S4, G4		X			
A noctuid moth, *Cucullia alfarata*	S2?, G4				X	X
A noctuid moth, *Macrochilo santerivalis*	S1S3, G3G4		X			
A noctuid moth, *Macrochilo sp 1*	S3, G3		X			
A noctuid moth, *Meropleon cosmion*	S1S2, G4			X		
A noctuid moth, *Meropleon titan*	S1, G2G4	X			X	
Chain fern borer moth, *Papaipema stenocelis*	S3, G4		X	X		
Half yellow moth, *Tarachidia semiflava*	S2S4, G4		X			
Lemmer's pinion moth, *Lithophane lemmeri*	S2, G3G4		X			
Maritime sunflower borer, *Papaipema maritime*	S1, G4					X
Pine Barrens bluet, *Enallagma recurvatum*	S3, G3		X	X		
Pink streak, *Faronta rubripennis*	S3, G3G4	X			X	
Precious underwing, *Catocala pretiosa pretiosa*	S2S3, G4		X	X	X	X

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Insects (continued)						
Rare skipper, *Problema bulenta*	S2, G2G3	X	X	X	X	X
Regal moth, *Citheronia regalis*	S3, G5			X		
Rippled wave, *Idaea obfusaria*	S2S4, G4G5		X	X		
Scarlet bluet, *Enallagma pictum*	S3, G3		X	X		
The consort, or consors underwing, *Catocala consors sorsconi*	S1S3, G4		X			
Fish						
Atlantic sturgeon	SC*/RP			X	X	X

* Federal species of special concern
**Potential presence
SC: Species of special concern as identified within the state.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
S & G: Conservation Ranks defined in Appendix I.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

Table DB5. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Species of Regional Priority	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Birds						
American black duck	RP	M	M	M	M	M
American woodcock	RP	I	I	I	I	I
Black scoter	RP				R	R
Bufflehead	RP	M		M	M	M
Canada Goose (Atlantic population)	RP	M	M	M	M	M
Canvasback	RP			I	I	
Clapper rail	RP	M	M	M	M	M
Greater scaup	RP			I	I	
Lesser scaup	RP			I	I	
Long-tailed duck	RP				R	R
Northern bobwhite quail	RP	R	R	R	R	R
Northern pintail	RP	I	I	I	I	I
Surf scoter	RP				R	R
Virginia rail	RP	R	R	R	R	R
White-winged scoter	RP				R	R
Wood duck	RP	M	M	M	M	M

RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table DB6. Fish Species

Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Species of Regional Priority	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Fish						
Margined madtom (*Noturus insignis*)	-		X			

X: Species present. Management strategy not yet determined.

Table DB7. Game Species

Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Species of Regional Priority	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Mammals						
River otter	-	M	M	M	M	M
Birds						
Ruffed grouse	-	R				
Sora rail	-	R	R	R	R	R

M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table DB8. Suites of Wildlife and their Location in the Delaware Bay Landscape

Common Name	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Mammals					
Forest Dwelling Bats	X	X	X		X
Birds					
Beach-nesting Birds			X	X	
Interior-forest Cavity-nesters		X	X		X
Savannah and Forest-edge Habitat Cavity Nesters	X	X	X		X
Coastal High Marsh Birds	X	X	X	X	
Coastal Low Marsh Birds	X	X	X	X	
Colonial Waterbirds	X	X	X	X	X
Forest Passerines	X	X	X		X
Forest Raptors	X	X	X		X
Freshwater Wetland Birds	X	X	X		X
Grassland Birds	X	X			
Migratory Shorebirds			X		X
Migratory Songbirds and Raptors	X	X	X	X	X
Scrub-shrub/Open Field (3-7 yrs) Birds	X	X	X		X
Early Succession (0 -3 years) Open Field Birds	X				
Waterfowl	X	X	X	X	X
Reptiles					
Forest Dwelling Reptiles		X	X		X
Reptile Inhabitants of Wetland, Marsh and Bog	X	X	X	X	X
Reptiles Associated with water (lakes, ponds, streams)	X	X	X		X
Reptiles of Special Concern	X	X	X	X	X
Amphibians					
Amphibians of Special Concern	X	X	X		X

Suites of Wildlife and their Location in the Delaware Bay Landscape (continued)

Common Name	Cohansey River	Maurice River Watershed	Tuckahoe River Watershed	Delaware Bay Shoreline	Cape May Peninsula
Amphibians (continued)					
Vernal Pool and Vernal Sinkhole Breeders	X	X	X		X
Insects					
Lepidoptera of Federal or State Legal Status		X	X		X
Lepidoptera of Special Concern	X	X			X
Odonata		X	X		X

X: Species occurs within the identified habitat.

E. Threats

The Delaware Bay region ranges from agricultural land around the Cohansey to forests in the Maurice, Tuckahoe and peninsula areas and to the saltmarshes of the bayshore. The overall threat to habitat and wildlife is habitat loss due to development, particularly on the Cape May Peninsula. Fragmentation of forests is a major threat to the forested areas of the Maurice and Tuckahoe, because of the forest dependent species that depend on them for survival. The publicly owned land, particularly in the Maurice and Tuckahoe areas, will be absolutely essential as core habitat for rare wildlife populations in the future; expanding those lands by both acquisition and private lands management will help to ensure viability of rare species in the state. Invasive plants and animals displace native species. Recreation on the waterways of the rivers and bays, in the resort areas of the peninsula, and illegal off-road vehicle use in forests continues to grow and should be addressed in management and education. Delaware Bay, as a major shipping and transportation port will continue to hold the threat of oil and chemical contamination to riparian habitats.

F. Conservation Zones, Assessments, and Strategies within the Delaware Bay Landscape

1. Cohansey River

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

This Conservation Zone in western Cumberland County encompasses the Cohansey River and its associated marshes and grasslands (Figure 12). The rich farmlands along the river system are an extension of predominant habitats of Salem County. Not all habitats classified as grassland are suitable for grassland birds, as agricultural uses often create unsuitable conditions for early-succession wildlife. The region has some stands of wild rice marshes, tidal marshes, freshwater wetlands, and upland pine-oak forest.

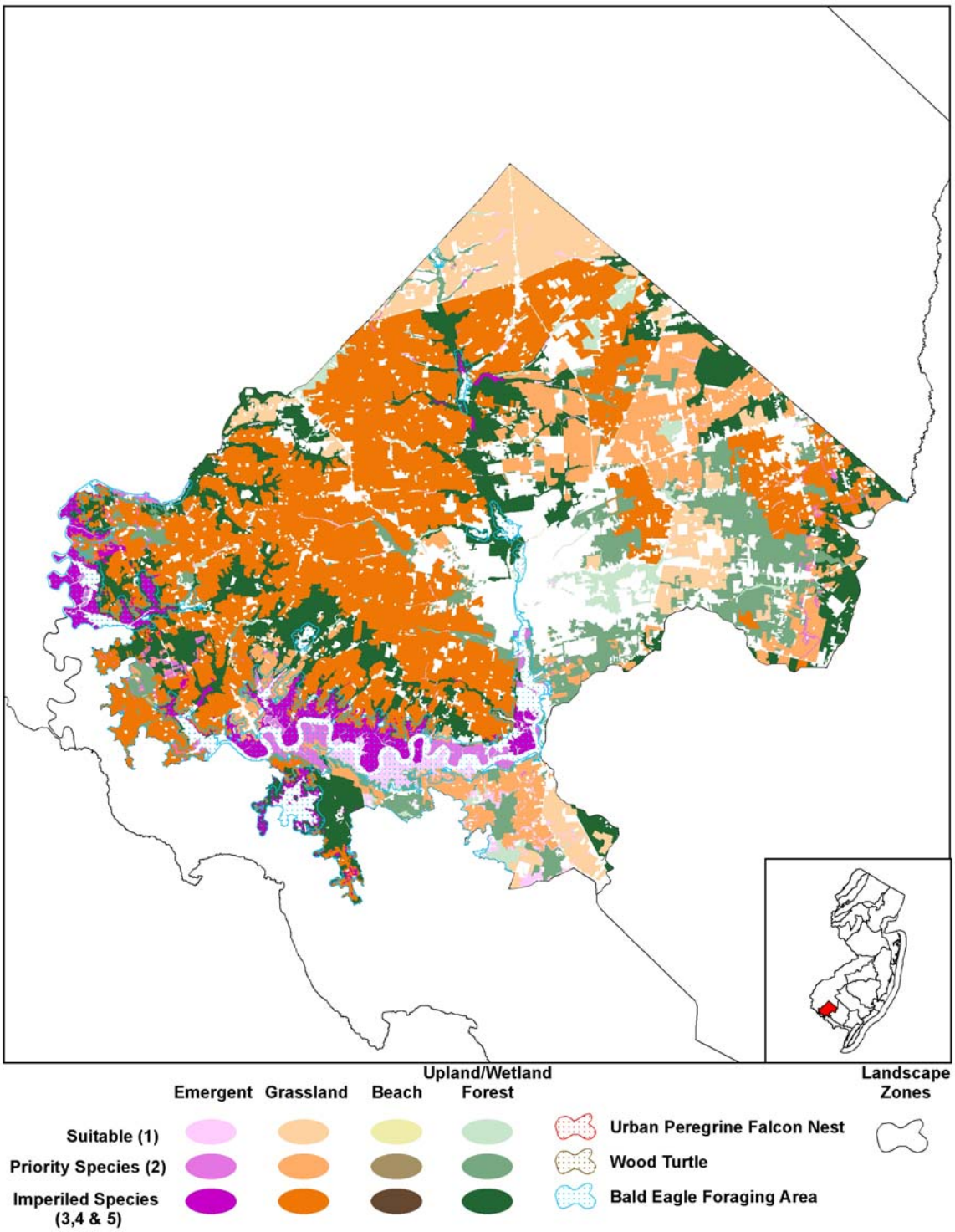
This zone has the least amount of public land in the Delaware Bay region, with approximately less than 405 hectares (1.5 sq. mi.). However, there are significant opportunities for preserving farmland and maintaining vast areas of tidal marsh.

b. Wildlife of Greatest Conservation Need

The Cohansey River region supports six state endangered, seven state threatened, and 48 special concern and regional priority wildlife species. Bald eagle, northern harriers, red-shouldered hawks, vesper sparrows, Cope's gray treefrogs, and bronze coppers are among the state endangered wildlife. State threatened species include barred owls, bobolinks, Cooper's hawks, grasshopper sparrows, ospreys, red-headed woodpeckers, and savannah sparrows. Special concern wildlife includes grassland birds, scrub-shrub birds, forest passerines, reptiles and amphibians. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, are suspected to occur in the Cohansey River zone.

The Cohansey River area is notable for supporting one of the densest bald eagle populations in the state for both nesting and wintering eagles. As part of the Atlantic Flyway, the habitats along the river are also important to the migration of songbirds, water birds, and raptors. Hardwood swamps and the mosaic of forest and agricultural land are habitat for bald eagles, migrating raptors and passerines, Cooper's and broad-winged hawks, and eastern box turtle. The grasslands are particularly valuable habitat for nesting grassland birds, supporting six listed grassland bird species. Marshes, tidal wetlands, and other wetlands are habitat for rails, northern harriers, bronze coppers, and rare damselflies and dragonflies. Tables DB9 - DB14 identify the species of greatest conservation need within this zone.

Figure 12. Critical landscape habitats within the Cohansey River conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of Cohansey River

Table DB9. Federal Endangered Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Reptiles				
Bog turtle		X		X

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
X: Species occurs within the identified habitat.

Table DB10. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American bittern		X		
Bald eagle		X	X	X
Loggerhead shrike			R	
Northern harrier		X	X	
Red-shouldered hawk				X
Vesper sparrow			X	
Amphibians				
Cope's gray treefrog				X
Insects				
Bronze copper		X		

R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table DB11. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	

X: Species occurs within the identified habitat.

Table DB12. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern red bat				X*
Eastern small-footed myotis				X*
Hoary bat				X*
Silver-haired bat				X*
Birds				
Acadian flycatcher				X
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Chimney swift			X	X
Chuck-will's-widow				X
Common barn owl			X	
Dickcissel			X	
Eastern kingbird			X	X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Great blue heron		X		
Great-crested flycatcher				X
Great egret		X		
Horned lark			R	
Indigo bunting			X	X
Kentucky warbler				X
Least bittern		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Pine warbler				X
Prothonotary warbler				X
Scarlet tanager				X
Seaside sparrow				
Whip-poor-will				X
Wood thrush				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle				X
Eastern king snake				X
Spotted turtle		X		
Amphibians				
Carpenter frog		X		X
Fowler's toad		X		
Marbled salamander		X		X
Insects				
Hessel's hairstreak		X		X
A noctuid moth, *Meropleon titan*		X		
Pink streak, *Faronta rubripennis*				X
Rare skipper, *Problema bulenta*				X

*Potential presence.
R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table DB13. Game Species of Regional Priority

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock				X
Bufflehead	X	X		
Canada Goose (Atlantic population)	X	X		
Clapper rail		X		
Northern bobwhite quail			X	X
Northern pintail	X	X		
Virginia rail		X		
Wood duck				

X: Species occurs within the identified habitat.

Table DB14. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		
Birds				
Ruffed grouse				X
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Cohansey River

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The Cohansey zone of the Delaware Bay landscape region remains a relatively rural area dominated by agriculture. However, critical wildlife habitat is threatened in a number of ways: fragmentation and loss of grasslands due to development expansion from Bridgeton; intensive agriculture methods that don't allow grassland birds to nest successfully; and conversion of grasslands and annual agriculture fields to nursery stock sites. The Cohansey River and its associated wetlands and forest patches are critical to the regional and statewide bald eagle nesting and wintering population, and are threatened by development associated with a growing human population, as well as potential heavy uses of the river for recreation and transportation. Furthermore, this zone contains very little publicly-owned land, so long-term protection will be a challenge. Landowner incentives and easements will be important conservation tools here. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Protect, enhance, and restore critical habitats as identified by the Landscape Project, focusing on habitat for grassland bird and scrub-shrub bird communities including grasslands (areas with >75 % herbaceous and <25% woody vegetation) and early-successional habitats with a mix of grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height).
- Protect, enhance, and restore critical habitats as identified by the Landscape Project, focusing on woodland and open habitats near waterways for species such as the bald eagle and osprey.
- Protect and enhance the tidal wetlands and open waters.
- Protect and enhance water quality and the availability of wetlands to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.

- Inventory and monitor all endangered, threatened and special concern wildlife in this zone.
- Prevent, stabilize, and reverse declines of grassland bird and scrub-shrub bird species, bald eagles, and rare invertebrate wildlife such as damselflies and dragonflies in the core grassland and agricultural areas of this zone.
- Maintain and enhance populations of nesting, wintering, and summering bald eagles.
- Monitor, maintain, and enhance populations of breeding, migratory, and wintering waterfowl of conservation concern.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Delaware Bay Regional Landscape stakeholders during a meeting held on September 12, 2007 (see *Attachment J*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1°	Revise existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2°	Use GIS, other remote sensing tools, and surveys to identify and map significant natural vegetative communities that may host wildlife species of conservation need, particularly on public lands and lands that serve as wildlife corridors. *(Conserve wildlife – rare wildlife)*
Protect critical grassland and early-succession habitats	
1°	Use GIS, other remote sensing tools, and surveys to identify critical grassland habitats and assess their condition for nesting birds, maintain information, and incorporate all new survey and mapping data into the Landscape Project and Biotics database. Identify protection strategies (e.g., landowner incentives, farmland preservation, and acquisition) to maintain large core areas of grassland in perpetuity. Identify proximate habitats that can be managed to enhance the total size of suitable grassland habitat, with the goal of managing grassland/early succession areas totaling 2,000-3,000 ha (7.7–11.5 square miles). *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Increase the effective size and connectivity of grasslands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of grasslands and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies, brush-hogging, and other appropriate methods with little or no impact to forested and wetland dependent species of greatest conservation need. Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Acquire habitat through direct purchase or easements and enlist private lands in preservation and management programs that offer long-term stability of a matrix of grassland schemes. Target 2,000 hectare (7.7 sq. mi.) regions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project; Agriculture – land management)*
2º	Develop, implement, and evaluate best management practices (BMPs) and guidelines to enhance habitats for resident and migratory grassland bird and scrub-shrub bird communities on public and private lands. *(Other practices – land management)*
2º	Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant populations of grassland and scrub-shrub birds. *(Protect habitat – migratory birds, Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
Protect critical woodland habitats and waterways	
1º	Develop, implement, and evaluate best management practices (BMPs) and guidelines to maintain, enhance, and/or restore bald eagle and forest-interior passerine and raptor habitat on public and private lands. *(Conserve wildlife – rare wildlife)*
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Use GIS, other remote sensing tools, and surveys to identify critical habitats supporting local bald eagle nesting, summering and wintering populations and assess their condition. Take action to minimize habitat loss and maintain contiguous habitats by restoring, enhancing, and/or protecting woodland and riverine habitats and waterways on public and private lands through direct purchase or easements. Enlist private lands in preservation programs that will maintain forest free of human disturbance during key periods. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Maintain and manage forest patches adjacent to marshes and grasslands for bald eagle and raptor suitability. Maintain and enhance floodplain forests for forest passerines and raptors. Set and implement guidelines for human disturbance on critical lands and allow forests and forest patches to mature to old growth to maximize suitability. *(Conserve wildlife – rare wildlife; Silviculture – land management)*
2º	Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant populations of bald eagles populations. *(Protect habitat – migratory birds, Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
Protect and enhance tidal wetlands and open water habitats.	
1º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Reestablish/restore historically important submerged aquatic vegetation beds in Delaware Bay tributaries to benefit waterfowl and waterbirds. *(Conserve wildlife – game species)*
2º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl, and include in marsh BMPs and species dependent on mudflats and impoundments. *(Conserve wildlife – rare wildlife, game species)*
Protect water quality and maintain adequate buffers	
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl, rare wildlife, fish; Enhance habitat – private lands)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
1º	Seek appropriate classifications for stream segments based on IBI results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*

Priority	Conservation Actions (continued)
Inventory, determine distribution, and monitor rare fish and wildlife	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.
1º	Survey suitable habitats to determine distribution and trends of grassland birds on a regular basis. Survey and monitor grassland bird nesting every four years, with more frequent surveys in actively managed grasslands. . *(Conserve wildlife – rare wildlife, Monitor wildlife – long-term monitoring)*
1º	Survey and monitor bald eagle nesting and production annually. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
1º	Survey and monitor osprey nesting and production every three years. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
1º	Survey and monitor woodland raptors' distribution every four years. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for bald eagle, osprey, spotted turtle, and special concern amphibian populations. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
2º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
Prevent and reverse declines of grassland birds, bald eagles, osprey, and other fish and wildlife species of conservation concern	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*

Priority	Conservation Actions (continued)
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, contaminants, food availability, hybridization, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement proactive habitat conservation goals that will meet and maintain the recovery needs of all endangered and threatened wildlife and fish populations, particularly for grassland and scrub-shrub species and bald eagles within this zone. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Develop a fish Index of Biotic Integrity (IBI) to better assess the presence and distribution of fish species within the area's streams. *(Protect habitat – fish)*
1º	Research the habitat requirements for grassland birds. Develop guidance on prescribed burning and other management techniques that benefit (and reduce negative impacts to) grassland species. Some techniques include delayed mowing, alternate patch mowing, timing restrictions for management, and cooperative agreements with utility companies for maintenance of rights-of-way. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
2º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (northern pine snakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
2º	Work with public and private landowners and managers with significant grassland bird and scrub-shrub/open field bird populations, bald eagle, cavity-nester, freshwater wetland bird, and raptor populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Enhance habitat – private lands; Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
Maintain and enhance bald eagle populations	
1º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
1º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Continue to monitor nest occupancy and reproductive success of bald eagles, and identify and monitor concentration and roosting areas to understand their role in population maintenance. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Monitor, maintain and enhance populations of breeding, migratory and wintering waterfowl of conservation concern	
1º	Use GIS, other remote sensing tools, and surveys to identify critical aquatic and wetland habitats and assess their condition for migratory and wintering waterfowl, finfish, and shellfish populations of conservation concern. Take action to minimize habitat loss by restoring, enhancing, and/or protecting habitat on public and private lands through protection strategies (e.g., acquisition, landowner incentives) and to maintain/ enhance existing waterfowl habitat where such management complements rare species management. *(Conserve wildlife – game species)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Determine carrying capacity of area marshes for wintering American black ducks to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, other remote sensing tools, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Work with appropriate government agencies to survey and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the southern pine beetle, gypsy moth, orange-striped oakworm, and oak lace bug. Take appropriate control methods to reduce tree damage and limit the spread of infestations, provided such methods avoid excessive direct or indirect harm to non-target species. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	Use appropriate measures to control the spread of phragmites in the tidal Cohansey River. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers and regulatory agencies to employ physical, chemical, or biological control measures, or a combination of these, to reduce invasive, non-indigenous plants in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by such plants. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Develop, implement, and evaluate management strategies to reduce the impacts of mute swan herbivory on native vegetation in impoundments and marshes of the Cohansey River supporting species of conservation concern. *(Conserve wildlife – invasives)*
1º	Monitor and evaluate the impacts of snow goose herbivory to the Cohansey River salt marshes and the native wildlife that rely upon this habitat. Develop, implement, and evaluate management strategies to minimize any unreasonable negative impacts on native wildlife, focusing on areas supporting species of conservation concern. *(Conserve wildlife – invasives)*
1º	Monitor and evaluate the impacts of vegetative damage to the wild rice marshes by resident Canada geese. Develop, implement, and evaluate management strategies to maintain and enhance the wild rice marshes by minimizing goose damage and controlling resident Canada goose populations. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer. *(Conserve wildlife - deer)*
Protect and enhance important and unique habitats	
1º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats, including but not limited to the Cohansey River, Stow Creek, Raccoon Ditch, and habitats in and adjacent to tidal wetlands. *(Protect habitat – migratory birds; Corridors – migratory birds)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Corridors – migratory birds; Protect habitat – migratory birds, Landscape Project)*

Priority	Conservation Actions (continued)
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public education and awareness and wildlife conservation	
1º	Raise public awareness of the Cohansey River as a significant bald eagle and raptor wintering area through newletters, press releases, brochures, presentations, and web pages. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*

Priority	Conservation Actions (continued)
2º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Encourage farmers to preserve farmland through conservation easements and Transfer of Development Rights (TDRs) through partnerships with NJ DEP's Green Acres, The Nature Conservancy–NJ Chapter, NJ State Agriculture Development Committee (NJ SADC), NJ Farm Bureau, local land trusts, and local municipalities for the conservation of bog turtle, forest and grassland bird populations.
- Use landowner incentive programs (DFW's LIP; USDA's NRCS programs; and USFWS' Partners for Fish and Wildlife) to encourage private landowners to manage for endangered and threatened species found on their property through restoration, protection or management activities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups (NJ Audubon Society, The Nature Conservancy, NJ Conservation Foundation) and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Involve Citizen Scientists in management projects and protection projects, such as protection and posting of bald eagle nesting areas and installing new osprey nest structures.
    - Recruit North American Butterfly Association volunteers to conduct surveys for lepidoptera species.
    - Promote backyard habitat management for migratory raptors and passerines.
- Collaborate with NJ Audubon Society to educate public on the effects of feral cats on wildlife species of conservation concern.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, Delaware, and West Virginia to develop best management practices and conservation plans for grassland and scrub-shrub/open field birds.
- Collaborate with researchers in Delaware, Maryland, Virginia, New York, and Pennsylvania to develop best management practices and conservation plans for bald eagle nesting, foraging and wintering areas.

- Consult with entomologists to design and conduct surveys for bronze coppers in wet meadows, marshes, fens, and other appropriate habitats.

Conservation Organizations

- Partner with watershed and conservation organizations such as NJ Audubon Society (NJAS) and The Nature Conservancy (TNC) to protect and enhance habitats for rare species.
    - Protect and enhance grassland bird habitats.
    - Protect bald eagle, osprey, and raptor nesting, foraging, and wintering areas.
    - Install new osprey nest structures.
- Consult with conservation and watershed organizations to develop educational programs such as classroom curricula and wildlife festivals.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USDA's Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS), and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to maintain and protect bald eagle, osprey, and grassland bird nesting and foraging sites.
    - DFW, conservation organizations, and land trusts to identify key lands for acquisition and conservation.
    - DFW and DEP's Division of Parks and Forestry (DPF) to pursue identification and mapping of significant natural vegetative communities, particularly on public lands and lands that serve as wildlife corridors, and integrate these in the Landscape Project.
    - DFW to develop a plan to protect sensitive endangered/threatened species areas from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bald eagle sites.
    - DFW and conservation organizations to work with the DEP's Land Use Regulation Program (LURP) to protect vernal pools and appropriately classify wetlands for spotted turtle, special concern amphibian, and bronze copper populations.
    - Expand efforts to create habitat and implement best management practices for grassland birds, forest passerines and raptors, and scrub-shrub birds on state lands and with natural resource managers, county and municipal utility authorities and planners.
    - Work with Division of Watershed Management and other DEP agencies to establish larger buffers for riparian and floodplain areas.
    - DFW to work with state and county mosquito commissions to reduce the use of deleterious insecticides and biological controls at known amphibian breeding sites.
    - DFW to work with USFWS and other state, federal, and non-governmental partners to implement North American Waterfowl Management Plan as appropriate.

  - DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan, seeking areas where such management complements rare species management.
  - DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration (NRCS) to plan for and assist with emergency oil spill response.
  - DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
- DFW to determine groundwater recharge areas for vernal pools with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
- DFW to work with DEP's Bureau of Water Monitoring and Standards to recommend appropriate stream classifications.
- DFW to lead in the development of educational materials for private landowners about wildlife of greatest conservation need and their habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts on a site-by-site basis.
- Annually monitor abundance, productivity, distribution, and trends of bald eagle, osprey (biannually), and grassland bird and scrub-shrub bird populations. Compare vegetation parameters and populations between managed/protected sites and non-managed sites to provide feedback into management strategies.
- Monitor contaminant levels in Cohansey River and Stow Creek fish that may impact bald eagle and osprey populations.
- Monitor species abundance of migratory raptors at key marsh-edge locations to determine trends in migration counts.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, Calling Amphibian Monitoring Program, and volunteer coverboard surveys.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

2. Maurice River Watershed

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

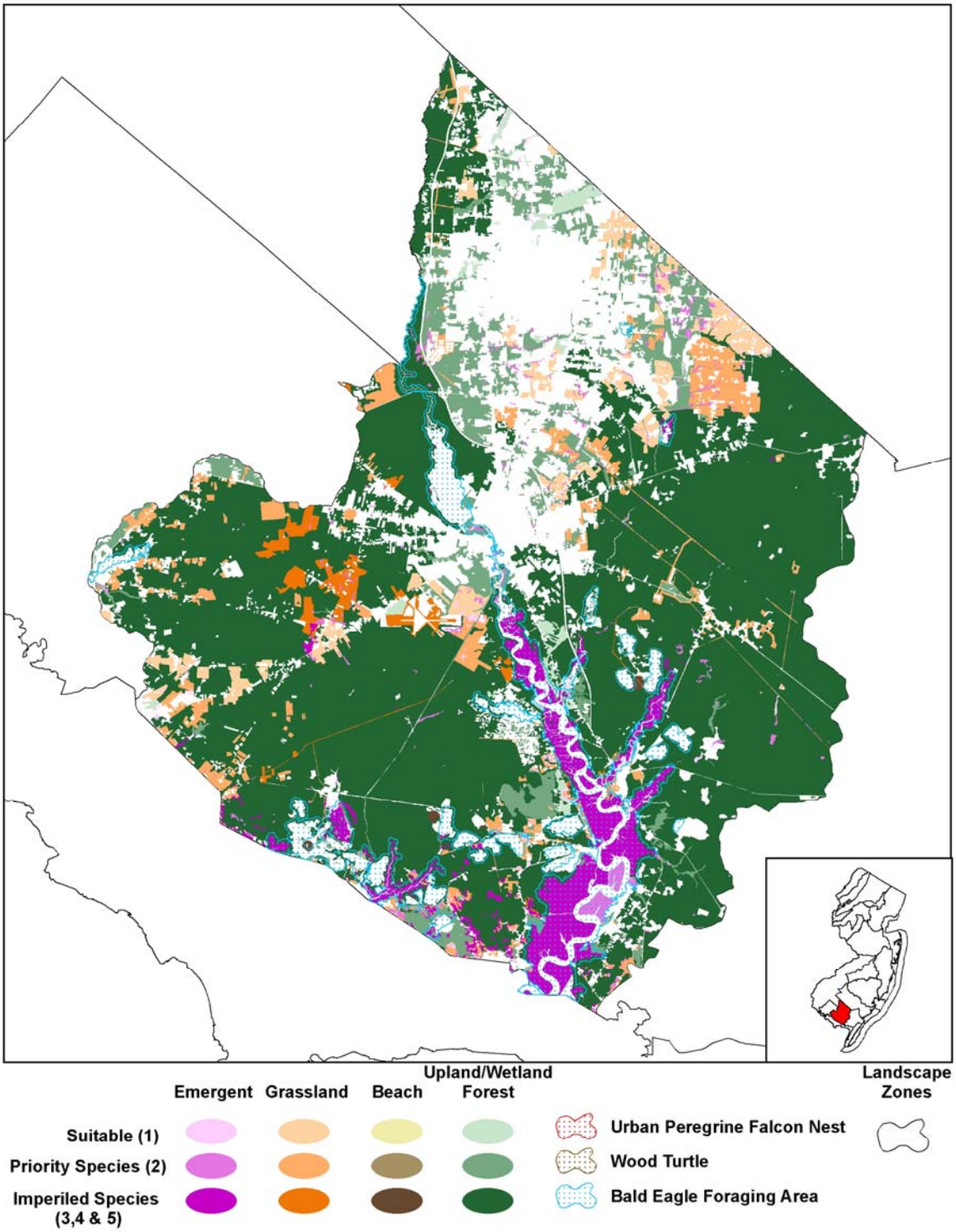
The nationally designated Wild and Scenic Maurice River is the western edge of the Pinelands National Reserve and is an important link between Pinelands and estuary habitats of Delaware Bay (Figure 13). Marshes of the Maurice River and its tributaries include the largest tidal, freshwater emergent marshes in New Jersey. Large tracts of undeveloped wetland forest and pine and oak upland forest characteristic of the Pinelands are found along the banks of the Maurice River. The Maurice River and its tributaries (the Manumuskin, Menantico, and Muskee creeks) hold habitats that are significant for many rare wildlife and plant populations.

This zone is most notable for large forest tracts, both upland and wetland, that are critical to the continuation of much of southern New Jersey's forest-interior wildlife populations. Fortunately for many rare species, large areas of state and conservation lands are found in this zone, including Union Lake WMA, Peaslee WMA, Buckshutem WMA, Clarks Pond WMA, Menantico Pond WMA, Millville WMA, Bear Swamp East Natural Area, and parts of Heislerville and Nantuxent WMAs. Manumuskin River Preserve and the Glades Wildlife Refuge are major holdings of conservation organizations.

b. Wildlife of Greatest Conservation Need

This zone is most notable for large forest tracts that support southern New Jersey's forest-interior bird populations, including barred owls and red-shouldered hawks, as well as northern pine snakes and forest-dwelling bats. The Maurice River, its tributaries, and the associated forests form the center of one of the densest nesting and wintering populations of bald eagles in the state. Indeed, Bear Swamp Natural Area hosts the oldest continuously-occupied eagle nest in the state, and the Maurice River has supported the state's most significant eagle wintering population since the 1970s. The Maurice River marshes host one of the largest fall populations of sora rails in the Atlantic Flyway and also serve as a key spring staging area for northern pintails. Wetlands associated with the river and its tributaries are important for rare amphibian populations such as the eastern tiger salamanders, Southern gray treefrogs, and Pine Barrens treefrogs. Rare butterfly, moth, dragonfly, and damselfly populations are found in microhabitats of the riverine system as well as in upland forests and rights-of-way, the benefactors of land dedicated to conservation. Tables DB15 – DB21 identify the species of greatest conservation need within this zone.

Figure 13. Critical landscape habitats within the Maurice River Watershed conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of Maurice River Watershed

Table DB15. Federal Endangered Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
X: Species occurs within the identified habitat.

Table DB16. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat				R
Birds				
American bittern		R		
Bald eagle		X	X	X
Least tern		X		
Northern harrier		X	X	
Peregrine falcon		X		
Red-shouldered hawk				X
Vesper sparrow			X	
Reptiles				
Corn snake				X
Timber rattlesnake				X
Amphibians				
Cope's gray treefrog		X		X
Eastern tiger salamander				X
Insects				
Bronze copper		X		

R: Research and possible restoration.
X: Species occurs within the identified habitat.

Table DB17. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black rail		X		
Black-crowned night heron		X		
Bobolink			X	X
Cooper's hawk				X
Grasshopper sparrow			X	
Long-eared owl				R**
Osprey		X		
Red knot		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Northern pine snake				X
Amphibians				
Pine Barrens treefrog		X		X
Insects				
Frosted elfin		X		X

**Suspected presence.
R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table DB18. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern red bat				X*
Eastern small-footed myotis				X*
Hoary bat				X*
Silver-haired bat				X*
Southern bog lemming			X	X
Birds				
Acadian flycatcher				X
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blackburnian warbler				X
Black-throated green warbler				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Canada warbler				X
Chimney swift			X	
Chuck-will's-widow				X
Common barn owl			X	
Eastern kingbird			X	X
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-peewee				X
Field sparrow			X	
Gray catbird			X	X
Great blue heron		X		
Great crested flycatcher				X
Great egret		X		
Green heron		X		
Hooded warbler				X
Horned lark			X	
Kentucky warbler				X
King rail		X		
Least bittern		X		
Least tern		X		
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Semipalmated sandpiper		X		
Sharp-shinned hawk				X
Snowy egret		X		
Spotted sandpiper		X		
Veery				X
Whip-poor-will				X
Willet		X		
Willow flycatcher				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Yellow-throated warbler				X
Reptiles				
Eastern box turtle				X
Eastern king snake				X
Northern diamondback terrapin		X		
Spotted turtle		X		X
Amphibians				
Carpenter frog		X		X
Fowlers toad		X		X
Marbled salamander		X		X
Insects				
Dotted skipper		X	X	
Hessel's hairstreak				X
A geometrid moth, Idaea violacearia				X
A noctuid moth, *Apamea inebriata*			X	
A noctuid moth, *Macrochilo santerivalis*			X	
A noctuid moth, *Macrochilo sp 1*			X	
Half yellow moth, *Tarachidia semiflava*			X	
Pine Barrens bluet, *Enallagma recurvatum*		X		
Precious underwing, *Catocala pretiosa pretiosa*				X
Rare skipper, *Problema bulenta*				X
Rippled wave, *Idaea obfusaria*			X	
Scarlet bluet, *Enallagma pictum*		X	X	
The consort, or consors underwing, *Catocala consors sorsconi*				X

*Potential presence.
X: Species occurs within the identified habitat.

Table DB19. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock				X
Canada Goose (Atlantic population)	X	X		
Clapper rail		X		
Northern bobwhite			X	X
Northern pintail	X	X		
Virginia rail		X		
Sora		X		
Wood duck		X		

X: Species occurs within the identified habitat.

Table DB20. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Margined madtom (*Noturus insignis*)	X

X: Species occurs within the identified habitat.

Table DB21. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		
Birds				
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Maurice River Watershed

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The Maurice River area is notable for large contiguous forest tracts that support populations of endangered and threatened forest wildlife, and much of that land is in conservation ownership. Threats, however, exist in the form of forest fragmentation due to development, primarily by the residential and industrial expansion of Millville and Vineland. Those two municipalities have the least amount of wildlife habitat remaining, while the townships of Downe, Lawrence, Commercial and Maurice River still contain larger forested areas. Forest interior wildlife species are particularly sensitive to fragmentation that opens the forest canopy and improves conditions for predators and competing edge species. Thus widening roads, creating power lines and converting forests to nursery operations are all threats. Sand and gravel operations have created large gaps in habitats, and most continue to impinge further on upland and swamp forests. The river ecosystem may be threatened by invasive species such as phragmites, and contaminants from nearby industry and oil spills. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Protect and enhance large, contiguous forest habitats identified by the Landscape Project for forest dependent species such as bald eagles and interior-forest passerines and raptors (especially red-shouldered hawks and barred owls).
- Protect and enhance freshwater wetland and open water habitats and water quality for ospreys, Cope's (Southern) gray treefrogs, eastern tiger salamanders, Pine Barrens treefrogs, foraging colonial waterbirds and waterfowl, and rare fish.

- Protect and enhance the tidal wetlands and open waters of the Maurice River and its tributaries for ospreys, foraging colonial waterbirds and waterfowl**.**
- Protect and enhance patch habitats for bronze copper and frosted elfin populations, and scrub-shrub bird communities where possible. Scrub-shrub habitats consist of areas with >25% woody vegetation <20 feet in height.
- Inventory and monitor endangered, threatened, and special concern wildlife in the Maurice River, its tributaries, and Bear Swamp forests, particularly forest-interior and forest-dependent wildlife, and rare fish, in addition to rare Lepidoptera and Odonata species.
- Prevent, stabilize, and reverse declines of interior-forest raptors and passerines (primarily), and stabilize populations of northern pine snakes, corn snakes, freshwater wetland birds, frosted elfins, special concern reptiles and amphibians, rare dragonflies and damselflies, butterflies and moths, and stabilize and reverse declines of rare fish populations such as the margined madtom.
- Maintain and enhance populations of nesting and wintering bald eagles, ospreys and northern harriers associated with the Maurice River and its tributaries.
- Monitor, maintain, and enhance populations of breeding, migratory and wintering waterfowl of conservation concern.
- Identify and survey habitats for presence of rare invertebrate wildlife, including damselflies, dragonflies, butterflies and moths.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife
- Prevent illegal collection of rare reptiles and amphibians.
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Delaware Bay Regional Landscape stakeholders during a meeting held on September 12, 2007 (see *Attachment J*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1°	Revise existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat value for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2º	Use GIS, other remote sensing tools, and surveys to identify and map significant natural vegetative communities that may host wildlife species of conservation need, particularly on public lands and lands that serve as wildlife corridors. *(Conserve wildlife – rare wildlife)*
Protect critical forest habitats identified by the Landscape Project	
1º	Increase the area of forest managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, pine snakes, corn snakes, black-throated green warbler, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey (in prep). • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create optimal habitat for barred owl and red-shouldered hawk. • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. • These forest types to also include but are not limited to: an uneven-age structure; mature forests and near-mature forest with >80% canopy closure, 65-80% canopy closure and structural diversity; limited areas of pine-oak with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Develop, implement, and evaluate best management practices and guidelines to maintain and enhance public and private lands along the Maurice River as a significant bald eagle and raptor wintering area, nesting ospreys, and in the entire zone for forest-interior passerines and raptors. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Use GIS, other remote sensing tools, and surveys to identify critical habitats supporting local bald eagle nesting, summering and wintering populations and assess their condition. Take action to minimize habitat loss and maintain contiguous habitats by restoring, enhancing, and/or protecting woodland and riverine habitats, riparian edge forests associated with the Maurice River, and waterways on public and private lands through direct purchase or easements. Enlist private lands in preservation programs that will maintain forest free of human disturbance during key periods. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Protect habitat – Landscape Project)*
2º	Use GIS, other remote sensing tools, and surveys to identify critical core forests and assess their condition for forest-nesting birds and bald eagles, maintain information, and incorporate all new survey and mapping data into the Landscape Project and Biotics database. Identify protection strategies (e.g., landowner incentives and acquisition) to maintain large core areas in perpetuity. Identify adjacent habitats that can be managed to enhance the total size of forest habitat. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
2º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant populations of bald eagles, forest-interior wildlife, and rare amphibian and invertebrate populations. *(Protect habitat – migratory birds, Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
Protect and enhance wetland and open water habitats and water quality	
1º	Use GIS, other remote sensing tools, and surveys to identify waterfowl and snow goose concentration areas and finfish and shellfish populations; incorporate into habitat protection and enhancement programs. *(Conserve wildlife – game species)*
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the NJ DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Enhance fisheries and fish habitat by removing obstructions to fish passage in rivers and streams. *(Protect habitat – fish)*
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Restore and protect NJ's critical non-trout streams through the use of protection strategies (e.g., acquisition of adjacent riparian habitats, working with municipality planning boards to require ecologically-sound buffers, easements).
1º	Develop, implement, and evaluate best management practices to enhance and/or restore aquatic and adjacent riparian habitats supporting populations of special concern and rare fish. *(Native wildlife – fish; Protect habitat – fish, Monitor wildlife - fish)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl, rare wildlife, fish; Enhance habitat – private lands)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
1º	Seek appropriate classifications for stream segments based on IBI results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl) and forest-interior songbirds. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Maintain water chemistry/ water quality important for aquatic-dependent or semi-dependent species native the Pinelands. For example, maintain low pH waters important for breeding populations of Pine Barrens treefrogs and carpenter frogs. *(Conserve wildlife – rare wildlife; Protect habitat – rare wildlife)*
Protect and enhance tidal wetlands and open water habitats.	
1º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Restablish/restore historically important submerged aquatic vegetation beds in Delaware Bay tributaries to benefit waterfowl and waterbirds. *(Conserve wildlife – game species)*
2º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl, and include in marsh BMPs and species dependent on mudflats and impoundments. *(Conserve wildlife – rare wildlife, game species)*
2º	Identify areas that may benefit from marine conservation zone status to protect sensitive habitats and species from human disturbance. Develop and implement protection measures in marine and riverine habitats. *(Protect habitat – humans)*
Protect and enhance habitats for scrub-shrub communities	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub (areas with >25% woody vegetation <20 feet in height) and open field habitats, assess their condition for local populations of frosted elfins (e.g., on powerlines), nesting birds (e.g., yellow-breasted chat, blue-winged warbler, brown thrasher), marsh-edge birds (e.g., sedge wrens), and other wildlife, maintain information, and incorporate all new survey and mapping data into the Landscape Project and Biotics database. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management strategies (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) to maintain, enhance, and/or create them. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
2º	Develop, implement, and evaluate best management practices for rights-of-way that benefit species with small area requirements (e.g., frosted elfin and early-successional birds). BMPs should focus on maintaining existing early succession habitats and work to establish new grassland and scrub-shrub habitats along utility line rights-of-way, at field/forest edges, and adjacent to fire breaks where appropriate for small-area species. *(Conserve wildlife – rare wildlife; Protect habitat –Landscape Project)*
2º	Develop, implement, and evaluate best management practices to protect, maintain, and/or enhance habitats (other than rights-of way) that support populations of bronze copper, frosted elfin, and scrub-shrub birds, particularly at locations where early-successional habitats are maintained for (other) primary purposes. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Promote landowner incentives and manager cooperation to protect and enhance local populations of frosted elfins (e.g., on powerlines), and scrub-shrub/open field birds (e.g., on airports). *(Conserve wildlife – rare wildlife; Other practices – land management)*
Inventory, determine distribution, and monitor rare fish and wildlife	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.
1º	Survey suitable habitats to determine distribution of forest wildlife of greatest conservation need and establish baseline information and long-term trends. Annually survey and monitor bald eagle nesting and production. Survey and monitor ospreys every two years, woodland raptors and passerines every four years. *(Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
1º	Conduct concentrated field sampling for listed or special concern fish species (e.g., margined madtom) in areas indicated by Fish Track Database queries and incorporate data into the Biotics database. *(Status – fish; Monitor wildlife – fish; Native wildlife – fish)*
1º	Identify and research water quality parameters for rare species such as bald eagle, osprey, spotted turtle, special concern amphibian, and rare dragonfly and damselfly populations. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Identify and research water quality parameters for spotted turtle, special concern amphibian, and rare dragonfly and damselfly populations. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Investigate habitat parameters of rare fish (e.g., margined madtom) and recommend management and protection guidelines. *(Native wildlife – fish; Protect habitat – fish; Monitor wildlife - fish)*
1º	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species. *(Protect habitat - mussels)*
2º	Survey suitable habitats to determine presence and distribution of timber rattlesnakes. Encourage landowners to report timber rattlesnake sightings for inclusion in the distribution mapping and potential inclusion in a telemetry study. Monitor habitat use and survival of encountered animals using radio-telemetry to locate dens and identify critical habitats. *(Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
2º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
2º	Conduct sampling (e.g., mist netting) to determine distribution, range, and habitat use of summer bats. Long-term sampling of forest dwelling bat species should be conducted to determine population trends and species response to changes in habitats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
2º	If Indiana bats are found, conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Investigate the habitat suitability and techniques for restoring bobcats to this zone. Conduct presence/absence surveys for bobcat using scent-post surveys within suitable habitat. *(Conserve wildlife – rare wildlife)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
Prevent, stabilize, and reverse declines of rare terrestrial and aquatic wildlife and fish	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitat, including causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, contaminants, food availability, hybridization, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*

Priority	Conservation Actions (continued)
1º	Develop and implement proactive habitat conservation goals that will meet and maintain the recovery needs of all endangered and threatened wildlife and fish populations, particularly for forest-interior species and bald eagles. These include guidelines for forest silviculture on public and private lands to enhance forest maturity and canopy, and replanting to reduce fragmentation. *(Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
1º	Develop a fish Index of Biotic Integrity (IBI) to better assess the presence and distribution of fish species within the area's streams. *(Monitor wildlife - fish)*
1º	Research the habitat requirements for species of conservation concern (e.g., forest passerines and woodland raptors, corn snakes, northern pine snakes, Cope's gray treefrogs, and Pine Barrens treefrogs) and implement planned silviculture practices to enhance forests for forest-dependent species. *(Protect habitat – Landscape Project; Silviculture – land management)*
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
1º	Conduct surveys determine locations of, and identify habitat management requirements for, secretive marsh nesting birds. *(Conserve wildlife – rare wildlife)*
2º	Research the impact of land use patterns on Pine Barrens treefrog, northern pine snake and corn snake populations. *(Protect habitat – sprawl; Corridors - sprawl)*
2º	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Divisions of Parks & Forestry and Fish & Wildlife to designate riding areas develop/implement BMPs. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*
2º	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g., implementing wildlife underpasses, road closures). *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
Maintain and enhance bald eagles, ospreys and northern harriers	
1º	Develop and implement proactive habitat conservation plans that will help meet and maintain recovery goals for bald eagle and osprey. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Develop and implement proactive habitat conservation plans that will help meet and maintain recovery goals for northern harrier and other high-marsh species. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Identify and research water quality parameters for bald eagle and osprey populations. Maintain data on those parameters to track trends and identify potential threats. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
Monitor, maintain, and enhance populations of breeding, migratory and wintering waterfowl of conservation concern	
1º	Use GIS, other remote sensing tools, and surveys to identify critical aquatic and wetland habitats and assess their condition for migratory and wintering waterfowl finfish, and shellfish populations of conservation concern. Take action to minimize habitat loss by restoring, enhancing, and/or protecting habitat on public and private lands through protection strategies (e.g., acquisition, landowner incentives) and to maintain/ enhance existing waterfowl habitat where such management complements rare species management. *(Conserve wildlife – game species; Protect habitat – Landscape Project)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Determine carrying capacity of area marshes for wintering American black ducks to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
Identify and survey habitats for rare invertebrate wildlife	
1º	Identify and research water quality parameters for rare dragonfly and damselfly populations. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
2º	Conduct surveys in appropriate habitats for frosted elfins, bronze coppers, and Hessel's hairstreaks and work with partners in conservation to determine species distribution and identify critical habitats and protection needs. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, other remote sensing tools, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*

Priority	Conservation Actions (continued)
1º	Work with appropriate government agencies to survey and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the southern pine beetle, orange-striped oakworm, gypsy moth, and oak lace bug. Take appropriate control methods to reduce tree damage and limit the spread of infestations, provided such methods avoid excessive direct or indirect harm to non-target species. *(Conserve wildlife – invasives)*
1º	Use appropriate measures to control the spread of Phragmites in the tidal Maurice River. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers and regulatory agencies to employ physical, chemical, or biological control measures, or a combination of these, to reduce invasive, non-indigenous plants in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species that are being threatened by such plants. *(Conserve wildlife – invasives)*
1º	Monitor and evaluate the impacts of vegetative damage to the wild rice marshes by resident Canada geese. Develop, implement, and evaluate management strategies to maintain and enhance the wild rice marshes by minimizing goose damage and controlling resident Canada goose populations. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Develop, implement, and evaluate management strategies to reduce the impacts of mute swan herbivory on native vegetation in impoundments and marshes of the Cohansey River supporting species of conservation concern. *(Conserve wildlife – invasives)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer. *(Conserve wildlife - deer)*

Priority	Conservation Actions (continued)
Prevent illegal collection of rare reptiles and amphibians	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
2º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (northern pine snakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
Protect and enhance important and unique habitats	
1º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) unique habitats such as Pinelands-ecotype forest and streams in the Manumuskin and Menantico tributaries, the older swamp forests of east and west Bear Swamps, and the drainages of the Maurice River. *(Protect habitat – migratory birds; Corridors – migratory birds)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Corridors – migratory birds; Protect habitat – migratory birds, Landscape Project)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public education and awareness and wildlife conservation	
1º	Raise public awareness of the Maurice River as a significant bald eagle and raptor wintering area through newletters, press releases, brochures, presentations, and web pages. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*

Priority	Conservation Actions (continued)
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop and maintain education brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Educate the public about the importance of the habitats within this zone to the Atlantic coast bird, bat, and Lepidopteran species' migration through newsletters, press releases, brochures, presentations, and web pages. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect and enhance habitat for forest birds, bald eagles, forest passerines and raptors.
    - Develop and implement incentive programs that encourage the management of forest communities.

- Through incentive programs, target private landowners adjacent to public natural lands to manage land for mature forest in order to increase effective size and connectivity of forest patches.
- Encourage farmers to preserve farmland through conservation easements through partnerships with the DEP's Green Acres Program, The Nature Conservancy–NJ Chapter, Natural Lands Trust, and local municipalities for the conservation of forest communities.
- In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.
- Work with landowners to maintain/enhance existing habitats where special concern fish species occur.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups (NJ Audubon Society, The Nature Conservancy-NJ Chapter, NJ Conservation Foundation, Natural Lands Trust) and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
    - Involve Citizen Scientists in management and protection projects, such as protection and posting of bald eagle nesting areas and building osprey nest structures.
    - Recruit North American Butterfly Association volunteers to conduct surveys for lepidoptera species.
- Promote backyard habitat management for migratory raptors and passerines, and for vernal pools where appropriate.
- Collaborate with NJ Audubon Society to educate public on the effects of feral cats on wildlife species of conservation concern.

Wildlife Professionals

- Collaborate with researchers in Delaware, Maryland, Virginia, New York, and Pennsylvania to continue to develop best management practices and conservation plans for bald eagle nesting, foraging and wintering areas.
- Consult with entomologists to design and conduct surveys for listed and rare invertebrates in appropriate habitats, and then develop best management practices and conservation plans.

Conservation Organizations

- Partner with Citizens United to Protect the Maurice River and its Tributaries and other conservation organizations such as NJ Audubon Society (NJAS), The Nature Conservancy-NJ Chapter (TNC) and NJ Conservation Foundation (NJCF) to protect and enhance habitats for rare species.
    - Work with TNC, NJAS, and NJCF to protect and enhance large tracts of contiguous forest, especially those adjacent to state lands.
    - Work with TNC and Citizens United to manage and protect bald eagle, osprey and raptor nesting and wintering areas.

    - Protect and enhance sites hosting significant populations of rare Odonates and Lepidopterans on conservation lands.
- Work with Citizens United to Protect the Maurice River and its Tributaries to develop local wildlife festivals and educational programs such as classroom curricula.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs, and other farm conservation programs.
- Work with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands.
- Partner with The Nature Conservancy–NJ Chapter to protect and enhance critical habitat where listed or special concern fish and wildlife species occur.

Academic Institutions

- Partner with Rutgers and other academic institutions to conduct studies necessary to better understand the impacts of deer on biodiversity, forest health, and ecosystem processes and to develop habitat-specific or landscape-specific deer density targets.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USDA-NRCS, USFWS, National Park Service (NPS), and the DCA, Office of Smart Growth, to protect, enhance, and create habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to maintain and protect bald eagle, osprey, and interior-forest bird nesting and foraging sites.
    - NJ and USFWS to develop a plan with state and federal wildlife law enforcement agents to protect sensitive endangered/threatened species areas from disturbance.
    - DFW and DEP's Division of Parks and Forestry (DPF) to work with the DEP's Office of Natural Lands Management, Natural Heritage Program (NHP) to develop mapping of significant natural vegetative communities, particularly on public lands and lands that serve as wildlife corridors, to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
    - DFW and DPF to collaborate on forest management guidelines to achieve forest management goals for listed and rare wildlife, on both public and private lands.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bald eagle sites.
    - DFW and conservation organizations to work with DEP's Land Use Regulation Program (LURP) to protect vernal pools and appropriately classify wetlands for Pine Barrens treefrog, Cope's gray treefrog, eastern tiger salamander, and rare dragonfly and damselfly populations.
    - Expand efforts to create habitat and implement best management practices for forest passerines and raptors, forest reptiles, and bald eagles on state lands and with natural resource managers, county and municipal utility authorities and planners.

  - Implement best management practices for scrub-shrub wildlife on power lines that cross Wildlife Management Areas and conservation lands, via the state permit process and direct communications with utility companies.
  - DFW to lead in the development of specific conservation plans for special concern reptiles and amphibians on state lands.
  - DFW to work with state and county mosquito commissions to reduce the use of deleterious insecticides and biological controls at known amphibian breeding sites.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to work with USFWS and other state, federal, and non-governmental partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan, seeking areas where such management complements rare species management.
  - DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration (NRCS) to plan for and assist with emergency oil spill response.
  - DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
  - DFW to develop guidelines for wildlife buffers with DEP's Division of Watershed Management, Bureau of Water Monitoring and Standards, and others, for important riparian and floodplain areas such as the Maurice River and its tributaries. Partner with them to investigate water quality and reduce threats of contaminants/pollution.
  - Improve habitat protection by partnering with the National Park Service's office for the Wild and Scenic River.
  - DFW to determine groundwater recharge areas for vernal pools with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
  - DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
  - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
  - DFW will work with DEP's Bureau of Water Monitoring and Standards to recommend appropriate stream classifications.
- DFW to lead in the development of educational materials for public and private landowners about forest-dependent wildlife and nesting and wintering bald eagles and their habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs, wildlife festivals, and wildlife viewing opportunities.

- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Annually monitor abundance, productivity, distribution, and trends of bald eagle, osprey (biannually), forest passerine and raptor populations, listed and special concern amphibian and reptile populations. Compare vegetation parameters and populations between managed/protected sites and non-managed sites to provide feedback into management strategies.
- Monitor contaminant levels that might impact bald eagle and osprey populations.
- Monitor species abundance of migratory raptors at key locations to determine migration count trends.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

3. Tuckahoe River Watershed

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

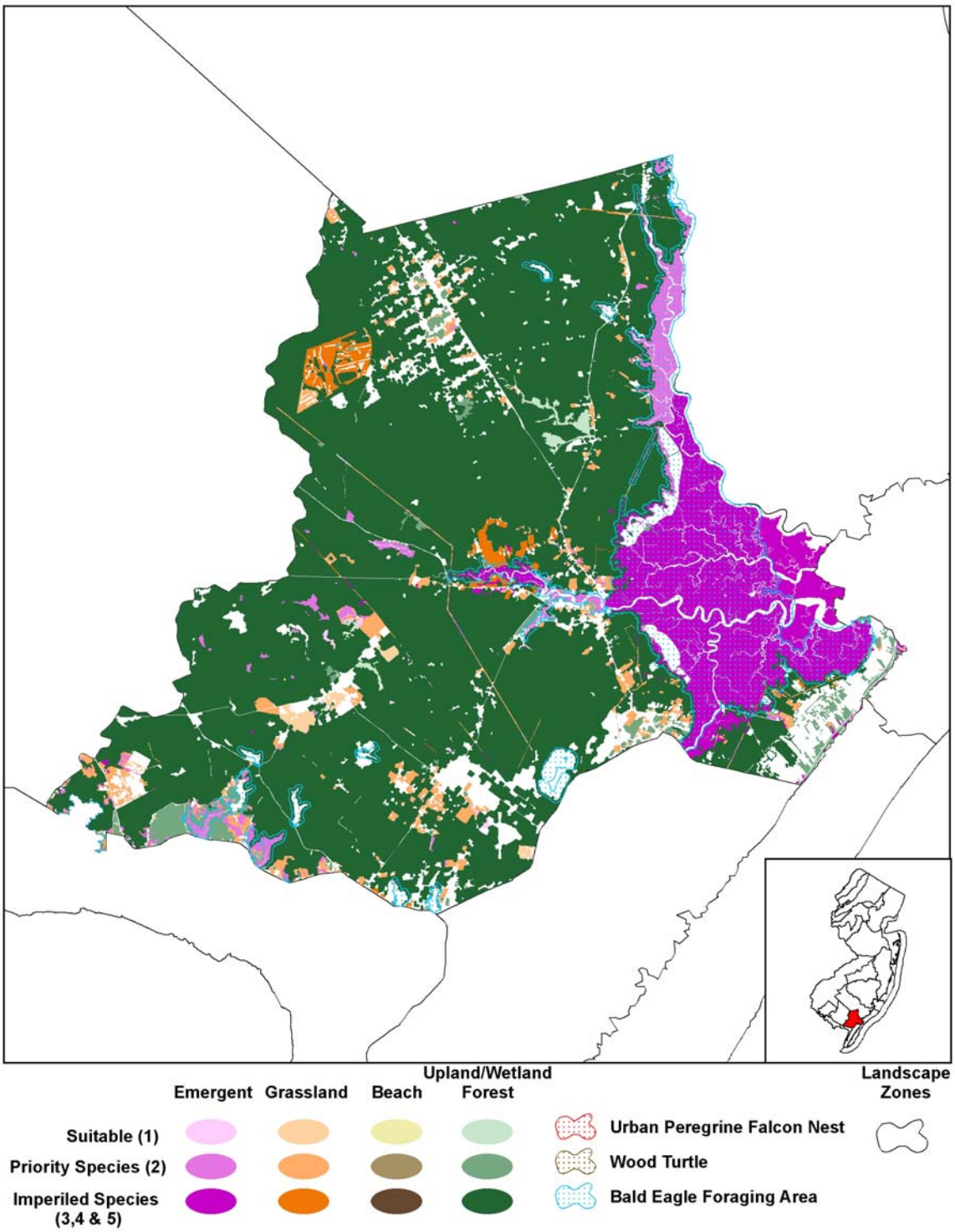
The Tuckahoe River Watershed fans upstream from Great Egg Harbor's open waters to the expansive marshes and lowland forests of Tuckahoe WMA, the Atlantic white cedar swamps, mixed hardwood swamps, and oak-hickory forest of Belleplain State Forest (Figure 14). It also includes parts of the pine-oak forests of Peaslee WMA, as well as the Corbin City WMA and Great Egg Harbor Greenway land.

b. Wildlife of Greatest Conservation Need

In the diverse array of habitats in the Tuckahoe River Watershed, of highest importance are forested uplands and wetlands. This zone is similar in many ways to the Maurice River zone in that it provides large, contiguous forest essential to southern New Jersey's forest bird populations, including barred owls and red-shouldered hawks. If these species are to thrive in southern New Jersey, the large forests of the Tuckahoe and Maurice River areas must be preserved and enhanced. This goal will also serve to support the large autumn bird migration through the Cape May Peninsula to the south, where habitat loss is seriously threatening this nationally important migration.

The wildlife of the Tuckahoe River Watershed includes six state endangered, 10 state threatened, and 66 special concern/regional priority species. The diverse forested wetlands and upland forests support bald eagles, cavity-nesters, forest passerines, scrub-shrub/open field birds, northern pine snakes, timber rattlesnakes, Cope's gray treefrogs, eastern tiger salamanders, Pine Barrens treefrogs, and frosted elfins. Open saltwater, impounded coastal marshes, tidal marshes and creeks of the Tuckahoe River are foraging habitat for bald eagles, common terns, ospreys, peregrine falcons, red knots and other migratory shorebirds, northern harriers and other coastal marsh birds, and foraging colonial waterbirds. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, are suspected to occur here. Tables DB22 – DB28 identify the species of greatest conservation need within this zone.

Figure 14. Critical landscape habitats within the Tuckahoe River Watershed conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of Tuckahoe River Watershed

Table DB22. Federal Endangered Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
X: Species occurs within the identified habitat.

Table DB23. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat				R
Birds				
American bittern		R		
Bald eagle		X	X	X
Least tern		X		
Northern harrier		X	X	
Peregrine falcon		X		
Red-shouldered hawk				X
Reptiles				
Timber rattlesnake				R
Amphibians				
Cope's gray treefrog		X		X
Eastern tiger salamander				X

R: Proposed research and/ or reintroduction of species.
X: Species occurs within the identified habitat.

Table DB24. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night heron		X		
Cooper's hawk				X
Long-eared owl				X
Osprey		X		
Red-headed woodpecker				X
Yellow-crowned night heron		X		
Reptiles				
Northern pine snake				X
Amphibians				
Pine Barrens treefrog		X		X
Insects				
Frosted elfin		X	X	X

X: Species occurs within the identified habitat.

Table DB25. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern red bat				X*
Eastern small-footed myotis				X*
Hoary bat				X*
Silver-haired bat				X*
Southern bog lemming			X	X
Birds				
Acadian flycatcher				X
American kestrel			X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
American oystercatcher		X		
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blackburnian warbler				X
Black-throated green warbler				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Canada warbler				X
Cattle egret		X	X	
Chimney swift			X	
Chuck-will's-widow				X
Common barn owl			X	
Common tern		X		
Eastern kingbird			X	X
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-peewee				X
Field sparrow			X	
Forster's tern		X		
Glossy ibis		X		
Gray catbird			X	X
Great blue heron		X		
Great crested flycatcher				X
Great egret		X		
Green heron		X		
Hooded warbler				X
Indigo bunting			X	
Kentucky warbler				X
King rail		X		
Least bittern		X		
Least tern		X		
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Rose-breasted grosbeak				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Sharp-shinned hawk				X
Snowy egret		X		
Spotted sandpiper		X		
Tri-colored heron		X		
Veery				X
Whip-poor-will				X
Willet		X		
Willow flycatcher				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Reptiles (continued)				
Eastern kingsnake				X
Northern diamondback terrapin		X		
Spotted turtle		X		X
Amphibians				
Carpenter frog		X		X
Fowlers toad		X		X
Marbled salamander		X		X
Insects				
A noctuid moth, *Meropleon cosmion*		X		
Chain fern borer moth, *Papaipema stenocelis*				X
Pine Barrens bluet, *Enallagma recurvatum*		X		
Precious underwing, *Catocala pretiosa pretiosa*				X
Rare skipper, *Problema bulenta*				X
Regal moth, *Citheronia regalis*				X
Rippled wave, *Idaea obfusaria*			X	
Scarlet bluet, *Enallagma pictum*		X	X	
Fish				
Atlantic sturgeon	X			

*Potential presence.
X: Species occurs within the identified habitat.

Table DB26. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock				X
Bufflehead	X	X		
Canada Goose (Atlantic population)	X	X		
Canvasback	X	X		
Clapper rail		X		
Greater scaup	X	X		
Lesser scaup	X	X		
Northern bobwhite quail			X	X
Northern pintail	X	X		
Virginia rail		X		
Wood duck		X		

X: Species occurs within the identified habitat.

Table DB27. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table DB28. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		
Birds				
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Tuckahoe River Watershed

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Fragmentation and loss of forest habitats are the greatest threats in this area. Expanding development associated with residential development for a growing human population is the main cause, particularly in Upper Township. Sand and gravel operations have created large gaps in habitats, and threaten to impinge further on upland and swamp forests. Recreational activities such as off-road vehicle use in Belleplain SF and Peaslee WMA disturb and degrade habitats for forest species. Aggressive forest harvest actions on Belleplain SF may threaten forest-interior nesting birds by creating openings that promote invasive and competing species, and by creating even-aged stands that depress wildlife diversity. Pressure on groundwater resources threatens Cope's gray treefrogs and other amphibians that depend on high quality breeding pools. Illegal off-road vehicles damage sensitive habitats, including vernal pools and wetlands, and are a particular problem on public lands. Contaminants (primarily organochlorines) from unknown sources continue to be detected in the area's bald eagles, ospreys and peregrine falcons. Invasive plants and animals threaten the ecological integrity of habitats in the region. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Protect, enhance, and restore large, contiguous tracts of forests as identified by the Landscape Project for long-term viability of large-area and mature forest birds, primarily barred owl and red-shouldered hawk. Maintain and enhance (where necessary) the connections of these forests to the Maurice River and Cape May Peninsula zones, as well as to the Pinelands landscape region.
- Identify, protect, and enhance small habitats and alternative-purpose habitats (e.g., rights-of-way) as identified by the Landscape Project to benefit frosted elfin populations and scrub-shrub bird communities. Scrub-shrub habitats consisting of areas with >25% woody vegetation <20 feet in height.
- Identify and protect freshwater and tidal salt marsh habitats as identified by the Landscape Project for wintering and foraging bald eagles, nesting ospreys and peregrine falcon, nesting rails, foraging colonial waterbirds and waterfowl, and migratory

shorebirds. Identify forested areas adjacent to riverine and tidal marshes necessary to maintain and expand bald eagle nesting and wintering populations.

- Identify, protect, maintain, enhance, and restore vernal pools and other wetlands and critical, permanent aquatic habitats as identified by the Landscape Project and the NJ DEP's vernal pool map to maintain viable populations of Cope's gray treefrog and eastern tiger salamander, Pine Barrens treefrog and other rare amphibians and reptiles, rare damselflies and dragonflies, and rare fish species.
- Protect and enhance water quality to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.
- Inventory, determine distribution, and monitor forest interior birds, bald eagles, and marsh nesting and foraging birds, rare amphibian and reptile populations, and other rare wildlife and fish species.
- Prevent, stabilize, and reverse declines of forest interior wildlife and endangered, threatened, and special concern fish species such as the Atlantic sturgeon and hickory shad. Stabilize populations of northern pine snakes, frosted elfins, coastal marsh birds, colonial waterbirds, migratory birds, freshwater wetland birds, and listed and special concern reptiles and amphibians, where most appropriate.
- Maintain bald eagle, osprey, peregrine falcon, northern harrier, northern pine snake, corn snake, and Pine Barrens treefrog populations.
- Monitor, maintain, and enhance populations of breeding, migratory and wintering waterfowl of conservation concern.
- Support the restoration of coastal marsh bird populations by recognizing and enhancing foraging habitats.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife
- Prevent illegal collection of rare reptiles and amphibians.
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Delaware Bay Regional Landscape stakeholders during a meeting held on September 12, 2007 (see *Attachment J*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1°	Revise existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat value for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
1º	Develop, implement, and evaluate best management practices and guidelines to maintain and enhance public and private as a significant bald eagle and raptor wintering area, nesting ospreys, and in the entire zone for forest-interior passerines and raptors. *(Conserve wildlife – rare wildlife)*
2º	Use GIS, other remote sensing tools, and surveys to identify and map significant natural vegetative communities that may host wildlife species of conservation need, particularly on public lands and lands that serve as wildlife corridors. *(Conserve wildlife – rare wildlife)*
Protect large contiguous tracts of forests	
1º	Increase the area of forest managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, pine snakes, corn snakes, black-throated green, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey (in prep). • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create optimal habitat for barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. • These forest types to also include but are not limited to: an uneven-age structure; mature forests and near-mature forest with >80% canopy closure, 65-80% canopy closure and structural diversity; limited areas of pine-oak with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Develop, implement, and evaluate best management practices and guidelines to maintain and enhance public and private lands for bald eagle and forest-interior passerines and raptors. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Use GIS, other remote sensing tools, and surveys to identify critical core forests and assess their condition for forest-nesting birds and bald eagles, maintain information, and incorporate all new survey and mapping data into the Landscape Project and Biotics database. Identify protection strategies (e.g., landowner incentives and acquisition) to maintain large core areas in perpetuity. Identify adjacent habitats that can be managed to enhance the total size of forest habitat. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
2º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Collaborate with Division of Parks and Forests to enhance Belleplain State Forest for wildlife species of conservation concern: uneven-age stand management, preserve standing and fallen dead biomass, eliminate harvest practices in wetland forests and manage adjacent upland forest for older-growth. *(Silviculture – land management; Protect habitat – Landscape Project)*
2º	Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant bald eagle and forest-interior wildlife sites. *(Protect habitat – migratory birds, Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
Identify, protect, and enhance habitats for scrub-shrub communities	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub (areas with >25% woody vegetation <20 feet in height) and open field habitats, assess their condition for local populations of frosted elfins (e.g., on powerlines), nesting birds (e.g., yellow-breasted chat, blue-winged warbler, brown thrasher), marsh-edge birds (e.g., sedge wrens), and other wildlife, maintain information, and incorporate all new survey and mapping data into the Landscape Project and Biotics database. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management strategies (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) to maintain, enhance, and/or create them. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*

Priority	Conservation Actions (continued)
2º	Develop, implement, and evaluate best management practices (BMPs) for rights-of-way that benefit species with small area requirements (e.g., frosted elfin and early-successional birds). BMPs should focus on maintaining existing early succession habitats and work to establish new grassland and scrub-shrub habitats along utility line rights-of-way, at field/forest edges, and adjacent to fire breaks where appropriate for small-area species. *(Conserve wildlife – rare wildlife)*
2º	Develop, implement, and evaluate best management practices to protect, maintain, and/or enhance habitats that support frosted elfin populations and scrub-shrub bird communities. *(Conserve wildlife – rare wildlife)*
Identify and protect freshwater and salt marsh habitats	
1º	Work with NJDEP-OCE, USACE, and other appropriate agencies to develop, implement, and evaluate best management practices for making dredged material deposition sites attractive to breeding, migrating, and wintering wildlife. *(Conserve wildlife – rare wildlife; Other practices – land management)*
1º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Restablish/restore historically important submerged aquatic vegetation beds in Delaware Bay tributaries to benefit waterfowl and waterbirds. *(Conserve wildlife – game species)*
2º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl, and include in marsh BMPs and species dependent on mudflats and impoundments. *(Conserve wildlife – rare wildlife, game species)*
2º	Identify areas that may benefit from marine conservation zone status to protect sensitive habitats and species from human disturbance. Develop and implement protection measures in marine and riverine habitats. *(Protect habitat – humans)*
Protect critical wetland and other aquatic habitats identified in the Landscape Project	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the NJ DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Develop, implement, and evaluate best management practices to enhance and/or restore aquatic and adjacent riparian habitats supporting populations of special concern and rare fish such as by removing obstructions to fish passage in rivers and streams. *(Protect habitat – fish; Monitor wildlife - fish)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl) and forest-interior songbirds. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species. *(Conserve wildlife – rare wildlife)*
Protect and enhance water quality	
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl, rare wildlife, fish; Enhance habitat – private lands)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
1º	Seek appropriate classifications for stream segments based on IBI results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
Inventory, determine distribution, and monitor rare fish and wildlife	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.
1º	Survey suitable habitats to determine distribution of forest wildlife of greatest conservation need and establish baseline information and trends. Survey and monitor bald eagle nesting and production. Annually survey and monitor ospreys every two-three years, woodland raptors and passerines every four years. Develop indices to monitor productivity of forest birds, especially listed and indicator species. Survey and monitor vernal pool habitats and populations. *(Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
1º	Conduct concentrated field sampling for listed or special concern fish species in areas indicated by Fish Track Database queries and incorporate data into the Biotics database. *(Status – fish; Monitor wildlife – fish; Native wildlife – fish)*

Priority	Conservation Actions (continued)
1º	Identify and research water quality parameters for vernal pool obligate and facultative species. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species. *(Protect habitat - mussels)*
2º	Conduct surveys in appropriate habitats for frosted elfins, bronze coppers, and Hessel's hairstreaks and work with partners in conservation to determine species distribution and identify critical habitats and protection needs. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
2º	Survey suitable habitats to determine presence and distribution of timber rattlesnakes. Encourage landowners to report timber rattlesnake sightings for inclusion in the distribution mapping and potential inclusion in a telemetry study. Monitor habitat use and survival of encountered animals using radio-telemetry to locate dens and identify critical habitats. *(Conserve wildlife – rare wildlife)*
2º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
2º	Conduct sampling (e.g., mist netting) to determine distribution, range, and habitat use of summer bats. Long-term sampling of forest dwelling bat species should be conducted to determine population trends and species response to changes in habitats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
2º	If Indiana bats are found, conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Investigate the habitat suitability and techniques for restoring bobcats to this zone. Conduct presence/absence surveys for bobcat using scent-post surveys within suitable habitat. *(Conserve wildlife – rare wildlife)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
Prevent, stabilize, and reverse declines of rare forest wildlife	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans; recreational vehicles)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitat, including causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, contaminants, food availability, hybridization, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement proactive habitat conservation goals that will meet and maintain the recovery needs of all endangered and threatened wildlife and fish populations, particularly for forest-interior species and bald eagle. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Develop, implement, and evaluate proactive habitat conservation goals that will meet and maintain the recovery needs of colonial waterbirds and freshwater wetland birds (consistent with the North American Waterbird Conservation Plan), and plans for amphibian and reptile populations (consistent with NE Amphibian and Reptile Conservation). *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Research the habitat requirements for species of conservation concern (e.g., forest passerines and woodland raptors, northern pine snakes, Cope's gray treefrogs, and eastern tiger salamanders) and implement planned silviculture practices as needed to enhance forests for forest-dependent species. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*

Priority	Conservation Actions (continued)
1º	Conduct surveys determine locations of, and identify habitat management requirements for, secretive marsh nesting birds. *(Conserve wildlife – rare wildlife)*
2º	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Divisions of Parks & Forestry and Fish & Wildlife to designate riding areas develop/implement BMPs. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*
2º	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g., implementing wildlife underpasses, road closures). *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
Maintain bald eagle, osprey, peregrine falcon, northern harrier, northern pine snake, and Pine Barrens treefrog populations	
1º	Develop, implement, and evaluate best management practices to maintain and enhance the Tuckahoe River as a significant bald eagle and raptor wintering area. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
1º	Develop, implement, and evaluate best management practices and guidelines to maintain, enhance, and/or restore habitat on public and private lands with significant forest bird areas, bald eagle, rare amphibian, and freshwater wetland bird populations. *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices and guidelines to maintain, enhance, and/or restore tidal marsh habitats to support northern harrier and osprey populations. *(Conserve wildlife – rare wildlife)*
1º	Develop and implement proactive habitat conservation plans that will help meet and maintain recovery goals for northern harrier and other high-marsh species. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Research the terrestrial habitat requirements for northern pine snakes, Cope's gray treefrogs, eastern tiger salamanders, and Pine Barrens treefrogs, and recommend appropriate management and regulations based on the results. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
2º	Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant populations of bald eagle, forest-interior wildlife, and rare amphibian and invertebrates. *(Protect habitat – migratory birds, Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
2º	Research the impact of land use patterns on Pine Barrens treefrog, northern pine snake, and corn snake populations. *(Protect habitat – sprawl; Corridors - sprawl)*

Priority	Conservation Actions (continued)
Monitor, maintain, and enhance populations of breeding, migratory and wintering waterfowl of conservation concern	
1º	Use GIS, other remote sensing tools, and surveys to identify critical aquatic and wetland habitats and assess their condition for migratory and wintering waterfowl, finfish, and shellfish populations of conservation concern. Take action to minimize habitat loss by restoring, enhancing, and/or protecting habitat on public and private lands through protection strategies (e.g., acquisition, landowner incentives) and to maintain/ enhance existing waterfowl habitat where such management complements rare species management. *(Conserve wildlife – game species)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Determine carrying capacity of area marshes for wintering American black ducks to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
Support the restoration of coastal marsh bird populations	
1º	Develop, implement, and evaluate best management practices in tidal marshes, including management for native vegetation and mosquito control beneficial to coastal birds. *(Other practices – land management)*
2º	Develop and evaluate the creation of a marine conservation area to minimize human disturbances and concomitant damage to habitat in areas of breeding and foraging marsh wildlife. *(Conserve wildlife - recreational vehicles; Evaluate restoration - recreational vehicles)*
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, other remote sensing tools, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Work with appropriate government agencies to survey and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the southern pine beetle, orange-striped oakworm, gypsy moth, and oak lace bug. Take appropriate control methods to reduce tree damage and limit the spread of infestations, provided such methods avoid excessive direct or indirect harm to non-target species. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	Use appropriate measures to control the spread of phragmites (common reed) and restore the marshes to native species. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers and regulatory agencies to employ physical, chemical, or biological control measures, or a combination of these, to reduce invasive, non-indigenous plants in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by such plants. *(Conserve wildlife – invasives)*
1º	Develop, implement, and evaluate management strategies to reduce the impacts of mute swan herbivory on native vegetation in impoundments and marshes of the Cohansey River supporting species of conservation concern. *(Conserve wildlife – invasives)*
1º	Monitor and evaluate the impacts of vegetative damage to the wild rice marshes by resident Canada geese. Develop, implement, and evaluate management strategies to maintain and enhance the wild rice marshes by minimizing goose damage and controlling resident Canada goose populations. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer.
Prevent illegal collection of rare reptiles and amphibians	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*

Priority	Conservation Actions (continued)
2º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS-NWR officers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (northern pine snakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
Protect and enhance important and unique habitats	
1º	Protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) lands surrounding Belleplain State Forest and Peaslee Wildlife Management Area for forest and forest-interior wildlife. *(Protect habitat – migratory birds; Corridors – migratory birds; Conserve wildlife – rare wildlife)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Corridors – migratory birds; Protect habitat – migratory birds, Landscape Project)*
2º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) the marsh and wetland forests of the Tuckahoe, and the marsh and upland edge of the Great Egg Harbor River system. *(Protect habitat – migratory birds; Corridors – migratory birds)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public education and awareness and wildlife conservation	
1º	Raise public awareness of the Tuckahoe River as a significant bald eagle and raptor wintering area through newletters, press releases, brochures, presentations, and web pages. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*

Priority	Conservation Actions (continued)
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Educate the public about the importance of the habitats within this zone to the Atlantic coast bird, bat, and Lepidopteran species' migration through newsletters, press releases, brochures, presentations, and web pages. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect and enhance habitat for forest birds, bald eagles, forest passerines and raptors, and coastal marsh birds.
    - Utilize incentive programs that encourage the management of forest communities.

    - Through incentive programs, target private landowners surrounding public natural lands to manage land for forests in order to increase effective size and connectivity of forest patches.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, The Nature Conservancy, Natural Lands Trust, and local municipalities for the conservation of forest communities.
    - Work with landowners to maintain/enhance existing habitats where listed special concern fish species occur.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Involve Citizen Scientists in monitoring and management projects, such as protection and posting of bald eagle nesting areas, surveying forest birds, and building osprey nest structures.
    - Recruit North American Butterfly Association volunteers to conduct surveys for rare butterfly and moth species.
- Promote backyard habitat management for resident and migratory birds, and for vernal pools where appropriate.
- Collaborate with NJ Audubon Society to educate public on the effects of feral cats on wildlife species of conservation concern.

Wildlife Professionals

- Collaborate with researchers in Delaware, Maryland, Virginia, New York, and Pennsylvania to continue to develop best management practices and conservation plans for bald eagle nesting, foraging and wintering areas.
- Consult with entomologists to design and conduct surveys for listed and rare invertebrates in appropriate habitats, and then develop best management practices and conservation plans.

Conservation Organizations

- Partner with watershed and conservation organizations such as NJ Audubon Society (NJAS) and The Nature Conservancy (TNC) to protect and enhance habitats for rare species.
    - Protect and enhance large tracts of contiguous forest; focus acquisition and protection adjacent to Tuckahoe, Belleplain and Peaslee state lands.
    - Protect bald eagle, osprey, and raptor nesting, foraging and wintering areas.
    - Identify, protect and enhance sites hosting significant populations of rare dragonflies, damselflies, butterflies, and moths.
- Consult with conservation organizations to develop educational programs such as classroom curricula and wildlife festivals.

- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs, and other farm conservation programs.
- NJDFW to partner with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands.

Academic Institutions

- Partner with Rutgers and other academic institutions to conduct studies necessary to better understand the impacts of deer on biodiversity, forest health, and ecosystem processes and to develop habitat-specific or landscape-specific deer density targets.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USDA-NRCS, USFWS, and the DCA, Office of Smart Growth to protect, enhance, and create habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to maintain and protect bald eagle and interior-forest bird nesting and foraging sites, with special focus on Tuckahoe, Peaslee and Belleplain state lands.
    - Expand efforts to create habitat and implement best management practices for forest passerines and raptors, forest reptiles, and bald eagles on state lands with DFW and DEP's Division of Parks and Forestry (DPF), and with natural resource managers, county and municipal utility authorities and planners.
    - DFW and DPF to work with the DEP's Office of Natural Lands Management, Natural Heritage Program (NHP) to develop mapping of significant natural vegetative communities, particularly on public lands and lands that serve as wildlife corridors, to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
    - DFW and DPF to collaborate on forest management guidelines to achieve forest management goals for listed and rare wildlife, on both public and private lands.
    - DFW to develop a plan with wildlife law enforcement agents to protect sensitive endangered/threatened species areas from disturbance.
    - DFW to coordinate with state and federal law enforcement to maintain adequate surveillance of bald eagle sites.
    - Implement best management practices for scrub-shrub wildlife on power lines that cross Wildlife Management Areas, State Forests, and conservation lands.
    - Encourage greater buffers for important riparian and floodplain areas such as the Tuckahoe and associated rivers with Division of Watershed Management. Partner with them to investigate water quality and threats of contaminants/pollution.
    - DFW and conservation organizations to work with the DEP's Land Use Regulation Program work to identify and protect vernal pools and appropriately classify wetlands for Cope's gray treefrogs, eastern tiger salamanders, Pine Barrens treefrogs, and rare invertebrate populations.

  - DFW and other agencies to promote the establishment of marine conservation areas in critical salt marsh habitats.
  - DFW to lead in the development of specific conservation plans for special concern reptiles and amphibians on state lands.
  - DFW to work with state and county mosquito commissions to reduce the use of deleterious insecticides and biological controls at known amphibian breeding sites.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
  - DFW to work with the Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to work with USFWS and other state, federal, and non-governmental partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan, seeking areas where such management complements rare species management.
  - DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration (NRCS), to plan for and assist with emergency oil spill response.
  - DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
  - DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
  - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
  - DFW to determine groundwater recharge areas for Cope's gray treefrog sites and vernal pools with the Division of Water Quality (DWQ) and the NJ Geological Survey. NJDFW to work with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
- DFW to lead in the development of educational materials for the public and private landowners about the importance of the area for forest birds, bald eagles, and marsh birds, as well as the fall bird migration.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs, wildlife festivals, and wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee Farmland Preservation, local land trusts, and through mitigation.

- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Annually monitor abundance, productivity, distribution, and trends of bald eagle, forest raptor and passerine (2-4 years), osprey (2-3 years), peregrine falcon, coastal marsh nesting and foraging bird (2-4 years), and freshwater wetland bird (2-4 years) populations.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Monitor contaminant levels that may impact raptor populations.
- Routinely monitor the population trends of vernal pool wildlife.
- Monitor population trends, breeding success, and habitat of reptiles near the edge of their range.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project, focusing on special concern reptiles, eastern tiger salamanders, Cope's gray treefrogs, and vernal pool obligate and facultative species, species that depend wholly or significantly on vernal pools for breeding.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

4. Delaware Bay Shoreline

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

The Delaware Bay Shoreline extends from Cape May Canal to Oyster Cove at the western corner of Cumberland County (Figure 15). The shoreline has critical beach, dune, and tidal and freshwater wetland habitats for migratory birds and other wildlife of the Coastal Plain.

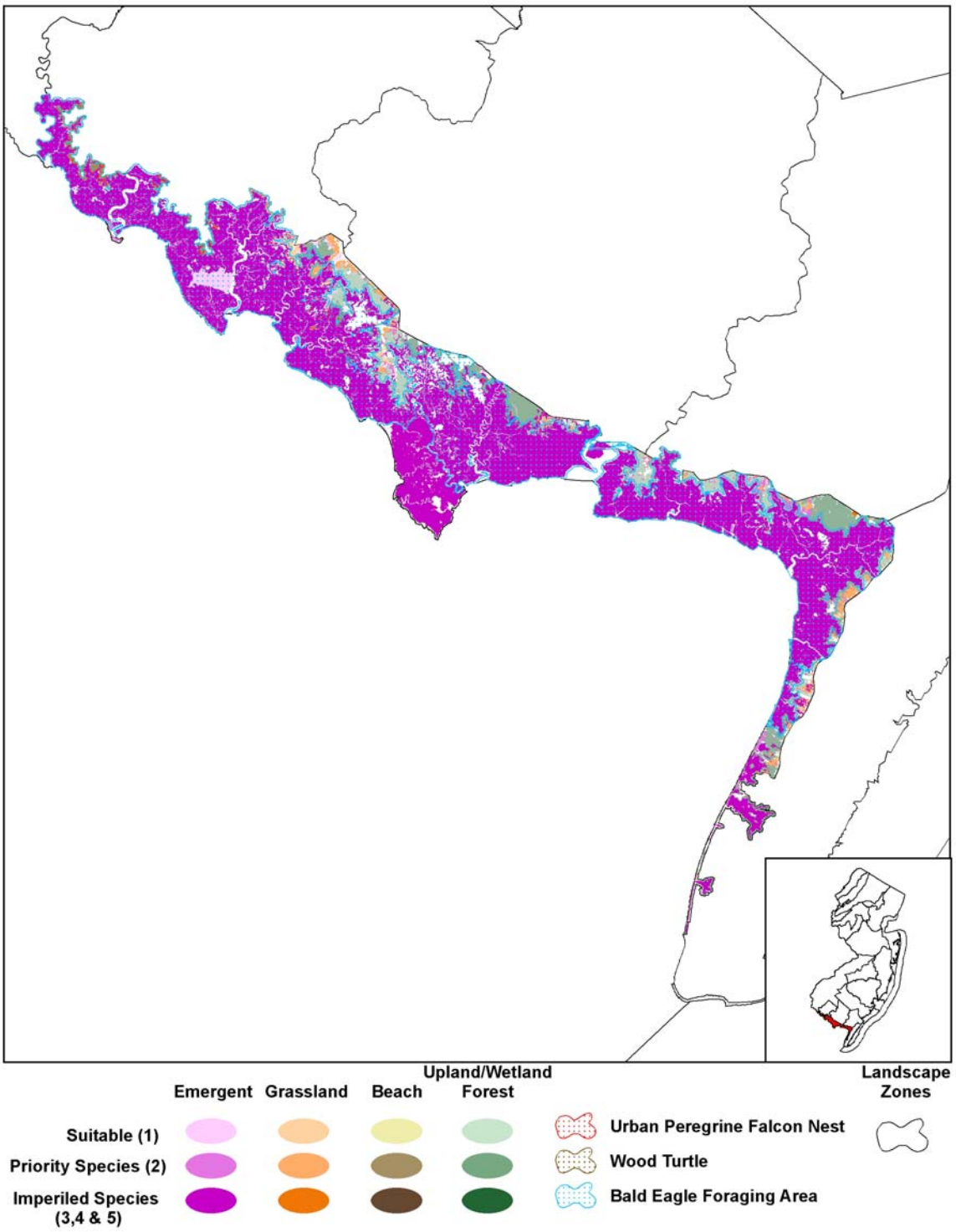
Priority areas along the Delaware Bay Shoreline include (from east to west) Cape May NWR-Delaware Bay Division, Dennis Creek WMA, Dennis Township PSE&G, Heislerville WMA, Maurice River and Commercial townships PSE&G, Egg Island WMA, Fortescue WMA, The Glades natural area, Nantuxent WMA, New Sweden WMA, Dix WMA, and Bayside WMA. Approximately 4,800 hectares (18.5 sq. mi.) of marsh have been restored since 1996 under the PSE&G estuary enhancement program, which converted artificial impoundments of salt hay farms (flooded once or twice a month) to daily-flooded tidal saltmarsh.

b. Wildlife of Greatest Conservation Need

There are six federal threatened, six state endangered, four state threatened, and 23 special concern wildlife species in the Delaware Bay Shoreline zone. The bald eagle, black skimmer, northern harrier, peregrine falcon, and sedge wren are among the state endangered wildlife. The black rail, black- and yellow-crowned night herons, osprey, and red knot are the state threatened species. Special concern wildlife include coastal marsh birds, colonial waterbirds, freshwater wetland birds, migratory raptors, migratory shorebirds, and the northern diamondback terrapin.

The Delaware Bay Shoreline is a critical migratory stopover for Western Hemispheric populations of migratory shorebirds, including red knot, ruddy turnstone, sanderling and semipalmated sandpiper. These migrants depend on the eggs of spawning horseshoe crabs for a major portion of their diets (50 to 90 percent) each spring before migrating from the Delaware Bay beaches to Artic nesting grounds. The beaches also occasionally support small numbers of beach-nesting birds (such as piping plovers), but these species are primarily found in the Coastal Landscape Region. Coastal marshes and freshwater wetlands are habitat for bald eagles, ospreys, peregrine falcons, the state's black rail population, and northern diamondback terrapins. The Delaware Bay region is a critical migration and wintering area for American black ducks in the Atlantic Flyway. The coastal marsh edge is a habitat line followed by many fall-migrating birds that avoid the open water Delaware Bay crossing and seek a shorter crossing up-bay, a decision that might aid in their survival. Tables DB29 – DB35 identify the species of greatest conservation need within this zone.

Figure 15. Critical landscape habitats within the Delaware Bay Shoreline conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Delaware Bay Shoreline

Table DB29. Federal Endangered Species*

Common Name	Water	Beach	Wetlands
Reptiles			
Green sea turtle	X		
Leatherback sea turtle	X		
Loggerhead sea turtle	X		
Hawksbill sea turtle	X		
Kemp's ridley sea turtle	X		
Fish			
Shortnose Sturgeon	X		

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
X: Species occurs within the identified habitat.

Table DB30. State Endangered Species

Common Name	Water	Beach	Wetlands
Birds			
Bald eagle			X
Black skimmer		X	X
Least tern		X	
Northern harrier			X
Peregrine falcon			X
Sedge wren			X
Short-eared owl			X
Black skimmer		X	X

X: Species occurs within the identified habitat.

Table DB31. State Threatened Species

Common Name	Water	Beach	Wetlands
Birds			
Black rail			X
Black-crowned night heron			X
Osprey			X
Red knot		X	X
Yellow-crowned night heron			X

X: Species occurs within the identified habitat.

Table DB32. Nongame Species of Conservation Concern

Common Name	Water	Beach	Wetlands
Mammals			
Marsh rat			X
Birds			
American oystercatcher			X
Common barn owl			
Common tern			X
Forster's tern			X
Glossy ibis			X
Great blue heron			X
Great egret		X	X
Green heron			X
King rail			X
Least bittern			X
Least tern		X	X
Little blue heron			X
Marsh wren			X
Ruddy turnstone		X	X
Saltmarsh sharp-tailed sparrow			X
Sanderling		X	X
Seaside sparrow			X
Semipalmated sandpiper		X	X
Sharp-shinned hawk			X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands
Birds (continued)			
Snowy egret			X
Willet		X	X
Reptiles			
Northern diamondback terrapin		X	X
Insects			
A geometrid moth, *Eusarca fundaria*			X
A noctuid moth, *Meropleon titan*			X
Fish			
Atlantic sturgeon	X		

X: Species occurs within the identified habitat.

Table DB33. Game Species of Regional Priority

Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beach	Wetlands
Birds			
American black duck	X		X
American woodcock			X
Black scoter	X		X
Bufflehead	X		X
Canada Goose (Atlantic population)	X		X
Canvasback	X		X
Clapper rail			X
Greater scaup	X		X
Lesser scaup	X		X
Long-tailed duck	X		X
Northern bobwhite			X
Northern pintail			X
Surf scoter	X		X
Virginia rail			X
White-winged scoter	X		X
Wood duck			X

X: Species occurs within the identified habitat.

Table DB34. Fish Species

Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table DB35. Game Species

Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Beach	Wetlands
Mammals			
River otter	X		
Birds			
Sora rail			X

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Delaware Bay Shoreline

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Migratory shorebirds on the Delaware Bay beaches are threatened by limited food availability. The high harvest of horseshoe crabs since 1991 has reduced the crab population and has led to declines in migratory shorebirds including red knots, sanderlings, semipalmated sandpipers, ruddy turnstones and other shorebirds. Human disturbance associated with recreation is a serious threat to migratory shorebirds. A significant threat to habitats here is risk of oil and hazardous materials spills: Delaware Bay is the second largest port for oil transport on the East coast, so oil spills (such as the *Athos I* in 2004) are a real threat to habitats and animal populations. Predation seems to be the limiting factor preventing colonial waterbirds and most beach-nesting birds from nesting on the Delaware Bayshore; their current habitat use is primarily for foraging and post-nesting roosting. Erosion of the shoreline has been an ongoing concern, potentially affecting their suitability and use by spawning horseshoe crabs; to date the decline in horseshoe crab population has masked possible effects of erosion. An increase in the rate of erosion, and changes to the entire marsh-shore system, may be expected with climate change and sea level rise. Shoreline loss due to bulkheads and jetties is a concern, but some beach area has been gained in recent years with restoration of beaches at Moore's and Thompson's beaches. Similarly, tidal marshes have been restored in the PSE&G estuary enhancement program that converted large areas of salt hay farms to tidal saltmarsh. Environmental impacts of aquaculture are largely unmeasured and poorly understood. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, and enhance critical habitats and resources in the salt marsh complex, beach front, and upland fringe of this zone for migratory shorebirds (including red knot), black rail, northern harrier, osprey, bald eagle, and peregrine falcon populations; migratory songbirds, coastal marsh birds, waterfowl, and colonial waterbird communities.
- Protect and enhance water quality to preserve aquatic ecosystems, particularly for species of conservation concern that rely on high water quality.
- Inventory, determine distribution, and monitor migratory shorebirds in beach and marsh habitats, and black rails, northern harriers, bald eagles, ospreys, peregrine falcons, foraging marsh birds, northern diamondback terrapins, and monitor the aquatic food chain.
- Prevent, stabilize, and reverse declines of migratory shorebirds and resident coastal marsh birds such as black rails and northern harriers, and endangered, threatened, and special concern fish species.
- Maintain bald eagle and osprey populations.
- Restore the horseshoe crab population to above 1990-1991 levels.

- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Delaware Bay Regional Landscape stakeholders during a meeting held on September 12, 2007 (see *Attachment J*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1°	Revise existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
1°	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat value for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2°	Use GIS, other remote sensing tools, and surveys to identify and map significant natural vegetative communities that may host wildlife species of conservation need, particularly on public lands and lands that serve as wildlife corridors. *(Conserve wildlife – rare wildlife)*
Protect critical habitats for migratory shorebirds, other coastal marsh wildlife	
1°	Develop, implement, and evaluate best management practices and guidelines to maintain and enhance habitats on public and private lands that support foraging bald eagles as well as osprey, shorebirds, peregrine falcon, northern harrier, and black rail on the bayshore, especially with regard to disturbance, mosquito control, and vegetation management in marshes. *(Conserve wildlife – rare wildlife)*
1°	Use GIS, other remote sensing tools, and surveys to identify critical aquatic and wetland habitats and assess their condition for migrating and wintering waterfowl finfish, and shellfish populations of conservation concern. Take action to minimize habitat loss by restoring, enhancing, and/or protecting habitat on public and private lands through protection strategies (e.g., acquisition, landowner incentives) and to maintain/enhance existing waterfowl habitat where such management complements rare species management. *(Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Work with the NJ Division of Fish and Wildlife Bureau of Law Enforcement, the Division of Parks and Forestry's State Park Police, and the USFWS officers to enforce regulations governing recreational activities (including but not limited to the use of personal watercraft, all terrain vehicles, etc.) in refuges and other sensitive habitats, and discourage activities that cause harm or disturbance to vegetation, wetlands and wildlife. *(Protect habitat – recreational vehicles)*
1º	Work with NJDEP-OCE, USACE, and other appropriate agencies to develop, implement, and evaluate best management practices for using dredged material to improve habitat for wildlife, particularly for spawning horseshoe crabs and migrating shorebirds. *(Conserve wildlife – rare wildlife; Other practices – land management)*
1º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Restablish/restore historically important submerged aquatic vegetation beds in Delaware Bay tributaries to benefit waterfowl and waterbirds. *(Conserve wildlife – game species)*
1º	Develop, implement, and evaluate best management practices to protect, enhance and restore marsh habitat, as appropriate. The primary focus is on habitat supporting coastal marsh birds, especially northern harrier and black rail, particularly with regard to mosquito control and vegetation management in marshes. Investigate and promote actions that will restore marshes to pre-grid-ditched hydrology. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds, Landscape Project)*
1º	Use GIS, other remote sensing tools, and surveys to identify critical Delaware Bay beach habitats and assess their condition for migratory shorebirds and maintain appropriate information. Identify protection strategies and best management practices to maintain suitable habitat for migratory shorebirds in perpetuity. *(Conserve wildlife – rare wildlife, Protect habitat – Landscape Project, Protect habitat – migratory birds)*
1º	Develop, implement, and evaluate best management practices to minimize beach loss and preserve optimal shoreline habitats for horseshoe crabs and migratory shorebirds. *(Protect habitat – migratory birds)*
1º	Investigate the potential for management and creation of migratory shorebird feeding and roosting areas on Cape May peninsula, particularly at Cox Hall Creek, Fishing Creek, and Cape May NWR. *(Protect habitat – migratory birds)*
2º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl, and include in marsh BMPs and species dependent on mudflats and impoundments. *(Conserve wildlife – rare wildlife, game species)*

Priority	Conservation Actions (continued)
2º	Identify areas that may benefit from marine conservation zone status to protect sensitive habitats and species from human disturbance. Develop and implement protection measures in marine and riverine habitats. *(Protect habitat – humans)*
2º	Develop, implement, and evaluate habitat management that will promote foraging and roosting of black skimmer and least tern where they are not ultimately limited by development and predators. *(Conserve wildlife – rare wildlife)*
2º	Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant migratory shorebird, bald eagle, migratory songbird, and tidal marsh bird populations. *(Protect habitat – migratory birds, Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
2º	Develop, implement, and evaluate best management practices for forest, shrub and field habitats along the upland edge of the shoreline and marshes for raptor and passerine suitability, especially to maintain feeding and roosting habitat for autumn-migrating landbirds. *(Protect habitat – migratory birds; Corridors – migratory birds)*
Protect water quality and maintain adequate buffers	
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl, rare wildlife, fish; Enhance habitat – private lands)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
1º	Seek appropriate classifications for stream segments based on IBI results that do not fulfill Category One requirements. *(Protect habitat – rare wildlife, fish)*
2º	Investigate impacts of aquaculture on water quality. Determine relative effects of locations and aquaculture techniques. Develop and implement management actions to minimize impacts. *(Conserve wildlife – rare wildlife; Protect habitat – rare wildlife, fish)*
Inventory and monitor migratory shorebirds and other coastal marsh wildlife and rare fish species	
1º	Survey suitable habitats to determine distribution of wildlife species of greatest conservation need and establish baseline information for monitoring population trends. Maintain shoreline surveys and develop marsh surveys for migratory shorebirds. Identify and record important migratory shorebird foraging and roosting areas. Conduct northern harrier and black rail surveys every two to four years. Develop baseline surveys for listed and special concern rail species, and migratory songbird use. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds; Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
1º	Conduct concentrated field sampling for listed or special concern fish species (e.g., Atlantic and shortnose sturgeon) at areas indicated by FishTrack Database. *(Status – fish; Monitor wildlife - fish)*
1º	Conduct surveys to identify migratory pathways of bats in the shoreline zone through telemetry or Radio Detection And Ranging (RADAR). Data to be used in evaluation of potential impacts of wind turbines or other coastal structures on migratory bat populations. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat - humans)*
1º	Assess population levels of listed and special concern rails, and determine whether directed management efforts are needed to reach or maintain viable population levels. *(Conserve wildlife – rare wildlife)*
1º	Monitor red knot movements to identify all habitats used in relation to food (horseshoe crab egg) densities, tide, and habitat conditions. Identify habitat standards to maintain optimal migratory shorebird populations and implement within land acquisition and management plans. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Determine carrying capacity of area marshes for wintering American black ducks to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions. *(Protect habitat – humans; Corridors – migratory birds)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
Prevent, stabilize, and reverse declines of coastal marsh wildlife (e.g., black rail, northern harrier)	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens, spawning and nursery sites) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
1º	Notify wildlife law enforcement agents (and when applicable, conservation organizations and local municipalities) of critical staging areas; identify and enforce the necessary restrictions to human activities. *(Protect wildlife - humans)*
1º	Reduce the impacts of human disturbance on red knots and other migratory shorebirds that use the intertidal zone of beaches and inlets by posting and/or fencing critical migratory sites, and developing management plans or policies that minimize human impacts. *(Protect wildlife - humans)*
1º	Control and reduce disturbance to red knots and migratory shorebirds by closing posted areas during peak migration periods and increasing the regular presence of state conservation officers at beach nesting bird sites during the nesting season. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds, Landscape Project)*
1º	Reduce the impacts of human disturbance on red knots and other migratory shorebirds that use the intertidal zone of beaches and inlets by posting and/or fencing critical migratory sites, and developing management plans or policies that minimize human impacts. *(Protect habitat – humans)*
1º	Investigate impacts of aquaculture on migratory shorebirds, waterfowl, finfish, shellfish, and other wildlife species of conservation concern. Determine relative effects of locations and aquaculture techniques. Develop and implement management actions to minimize impacts. *(Conserve wildlife – rare wildlife, game wildlife; Aquaculture – land management)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitat, including causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, contaminants, food availability, hybridization, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*

Priority	Conservation Actions (continued)
1º	Develop and implement proactive habitat conservation goals that will meet and maintain the recovery needs of shorebirds, coastal marsh birds, migratory songbirds, colonial waterbirds, waterfowl (consistent with the U.S. Shorebird Conservation Plan and the North American Waterbird Conservation Plan), and finfish and shellfish. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
1º	Develop and implement proactive habitat conservation plans that will help meet and maintain recovery goals for northern harrier and other high-marsh species. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Research the population size, recruitment, habitat requirements, and threats to the northern diamondback terrapin population; and population distribution to determine critical areas for protection. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Assess changes in availability of low and high marsh, directly, and by using indicator species (black rail, northern harrier), and relate habitat changes to marsh management practices. Evaluate management practices and revise as appropriate to benefit species of conservation concern. *(Conserve wildlife – rare wildlife)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify key road-crossing areas of northern diamondback terrapin and work with appropriate government agencies to install turtle crossing signs and erect turtle barriers or provide safe passage, as appropriate, depending on the habitat and location. *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors - roads)*
1º	Develop strategies to restore horseshoe crab populations to 1990 level, using methods including (but not limited to) harvest restrictions, minimizing beach loss and development, and beach enhancement. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds, Landscape Project)*
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
2º	Investigate the utility of a marine conservation area to protect sensitive species and habitats in the bayshore area from disturbance and habitat degradation. *(Protect habitat - humans)*
2º	Enhance northern diamondback terrapin populations by: a) determine the sustainable population goal, b) enforcing compliance with current crab trap regulations (e.g. turtle excluder devices), c) evaluating if current regulations are sufficient, in conjunction with naturally occurring survivorship rates, to protect and reduce mortality of northern diamondback terrapin populations, and d) closing the harvest season until sustainable population levels are reached. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
Prevent, stabilize, and reverse declines of rare fish species	
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife - fish; Protect habitat – Landscape Project)*
1º	Develop, implement, and evaluate best management practices to enhance and/or restore aquatic and adjacent riparian habitats supporting populations of special concern and rare fish. *(Protect habitat – fish; Monitor wildlife - fish)*
1º	Develop a fish Index of Biotic Integrity (IBI) to better assess the presence and distribution of fish species, and to restore and protect NJ's non-trout streams in the Lower Delaware River drainage. *(Native wildlife – fish; Status – fish; Monitor wildlife - fish)*
1º	Conduct concentrated field sampling for listed or special concern fish species in areas indicated by FishTrack Database queries and incorporate data into the Biotics database. *(Status – fish; Monitor wildlife – fish; Native wildlife - fish)*
Maintain bald eagle and osprey populations	
1º	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available. *(Protect habitat – humans)*
1º	Develop and implement proactive habitat conservation plans that will help meet and maintain the recovery goals for bald eagles and ospreys. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Identify and research water quality parameters for bald eagle and osprey populations. Maintain data on those parameters to track trends and identify potential threats. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Continue to monitor nest occupancy and reproductive success of bald eagles, osprey, and peregrine falcons, and identify and monitor bald eagle concentration and roosting areas to understand their role in population maintenance. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Restore horseshoe crab population to above 1990-1991 level	
1º	Develop strategies to restore horseshoe crab populations to 1990 level, using methods including (but not limited to) harvest restrictions, minimizing beach loss and development, and beach enhancement. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds, Landscape Project)*

Priority	Conservation Actions (continued)
1º	Implement or enhance an ecosystem-level (as opposed to single-species level) approach to the conservation of horseshoe crabs in Delaware Bay and the mid-Atlantic region. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
1º	Monitor horseshoe crab population and egg densities relative to migratory shorebird needs, and recommend management to increase horseshoe crab populations in the short term (e.g., harvest restrictions) and long term (e.g., habitat enhancement and harvest moratorium). *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds)o*
2º	Develop, implement, and evaluate BMPs for shoreline management to maintain and enhance horseshoe crab spawning habitat. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
Maintain natural biodiversity, community integrity and structure, and ecosystem function by controlling invasive and overabundant species	
1º	Use appropriate measures to control the spread of phragmites (common reed) and restore the marshes to native species. *(Conserve wildlife – invasives)*
1º	Develop, implement, and evaluate management strategies to reduce the impacts of mute swan herbivory on native vegetation in impoundments and marshes of the Cohansey River supporting species of conservation concern. *(Conserve wildlife – invasives)*
1º	Monitor and evaluate the impacts of snow goose herbivory to the salt marshes of the Delaware Bay shoreline and the native wildlife that rely upon this habitat. Develop, implement, and evaluate management strategies to minimize any unreasonable negative impacts on native wildlife, focusing on areas supporting species of conservation concern. *(Conserve wildlife – invasives)*
1º	Assess the impact of laughing gull population on habitat used by migratory shorebirds to assess the need for integrated wildlife damage management of gulls is necessary. *(Protect habitat – migratory birds)*
Protect and enhance important and unique habitats	
1º	Develop and implement long term protection for beaches on the lower bayshore, including Villas, Kimble's and Reed's beaches, which are particularly important to migrating shorebirds in spring, as is the vast marsh matrix of Egg Island Wildlife Management Area between Fortescue and the Maurice River. *(Protect habitat – migratory birds; Corridors – migratory birds; Conserve wildlife – rare wildlife)*
1º	Develop and implement long term protection for habitats along the major rivers of the Cohansey, Back Creek, Nantuxent, and the Maurice, as centers of bald eagle nesting and wintering populations for southern NJ. *(Protect habitat – migratory birds; Corridors – migratory birds; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. Recognize the particular importance of the autumn migratory corridor along the upland edge of bayshore marshes. *(Corridors – migratory birds; Protect habitat – migratory birds, Landscape Project)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public education and awareness and wildlife conservation	
1º	Develop, maintain, and enhance opportunities for ecotourism on Delaware Bayshore in a manner consistent with wildlife and habitat enhancement including but not limited to the creations of interpretive trails, the creation of viewing areas, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, targeting southern (residential) beaches. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop and maintain education brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters to educate the public education and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Educate the public about the importance of the habitats within this zone to the Atlantic coast bird, bat, and Lepidopteran species' migration through newsletters, press releases, brochures, presentations, and web pages. *(Education – humans)*
2º	Develop targeted outreach brochures for pet owners, outdoor-recreation enthusiasts, and local citizens adjacent to critical habitats about the importance of specific habitats to populations of migratory birds and the importance of maintaining disturbance-free areas for them. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect bald eagle, osprey, peregrine falcon, high-marsh nesting birds, and coastal marsh-edge nesting areas.
    - Work with landowners to maintain/enhance existing habitats where listed special concern fish species occur.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, Natural Lands Trust, The Nature Conservancy-NJ Chapter, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations (e.g., shorebird surveys in spring and fall and northern diamondback terrapin nesting).
    - Involve Citizen Scientists in management projects and protection projects, such as protecting migratory shorebird feeding areas, shorebird banding and sightings, and building osprey nest structures.
- Promote backyard habitat management for migratory raptors.
- Collaborate with NJ Audubon Society to educate public on the negative effects of feral cats on wildlife species of conservation concern, and the problems unleashed dogs cause migratory shorebirds.

Conservation Organizations

- Partner with watershed groups (such as Delaware Riverkeeper) and conservation organizations such as NJ Audubon Society (NJAS), The Nature Conservancy (TNC) and Natural Lands Trust to protect and enhance habitats for rare species.
    - Protect bald eagle, osprey, peregrine falcon, and coastal marsh bird nesting and foraging sites.
- Consult with conservation organizations to develop educational programs and wildlife festivals.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres and local land trusts.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA-NRCS, USFWS, and the DCA, Office of Smart Growth to protect and enhance habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to maintain and protect habitats for bald eagle, colonial waterbird, osprey, peregrine falcon, and coastal marsh bird nesting and foraging.
    - DFW to develop a plan with wildlife law enforcement agents to protect all of the important habitats for spring-migrating shorebirds from disturbance.
    - DFW to work with wildlife law enforcement and municipalities to develop a plan to limit public access and disturbance to marsh bird nesting sites, and to maintain

enforcement of regulations protecting northern diamondback terrapins from crab traps.

- DFW and USFWS to work together at Cape May NWR and WMAs to enhance refuge habitat for forest interior nesters and migratory landbirds.
- DFW will lead the investigation of establishing marine conservation zone(s).
- DFW will work with individual municipalities, DPF, the US Fish and Wildlife Service, and other landowning entities to target predators and reduce their effects on ground-nesting bird colonies near Cape May.
- DFW and conservation organizations will work with the DEP's Land Use Regulation Program (LURP) to protect and appropriately classify wetlands for spotted turtle, carpenter frog, Fowler's toad, and marbled salamander populations.
- DFW will work with LURP to discourage permitting of bulkheads and other "hardening" of the shoreline and to seek mitigation projects that will enhance shoreline and salt marsh habitats for wildlife.
- Develop and implement best management practices for marsh habitats to enhance habitat for migratory shorebirds, high and low marsh birds, and migratory raptors and passerines on state lands and with natural resource managers, county and municipal utility authorities and planners.
- DFW to work with the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers to ensure that beach fill and beach re-nourishment projects include migratory shorebird–horseshoe crab habitat enhancement.
- DFW to work with the U.S. Fish and Wildlife Service and others to restore tidal wetlands where appropriate for migratory shorebirds, marsh birds, raptors and songbirds.
- DFW to work with state and county mosquito commissions to implement marsh management that improves marshes for migratory shorebirds, rails and harriers, allowing for moist-soils as well as native salt marsh vegetation.
- DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
- DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to work with USFWS and other state, federal, and non-governmental partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan as appropriate, seeking areas where such management complements rare species management.
- DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration (NRCS) to plan for and assist with emergency oil spill response.
- DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.

  - DFW to determine groundwater recharge areas for Cope's gray treefrog breeding pools with the Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
  - DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need, their habitats, the potential harmful effects of disturbance on beach-nesting and coastal marsh birds, and the importance of the Delaware Bay migratory stopover.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee Farmland Preservation, local land trusts, and through mitigation.
- Support the completion of land acquisition in the US Fish and Wildlife Service's Cape May National Wildlife Refuge acquisition boundary, and expansion of that boundary (per Cape May NWR Comprehensive Conservation Plan, 2004).
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at federal, state, and local levels.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time using aerial photography; monitor efficacy of habitat management and restoration efforts, and relate habitat changes to key indicator wildlife species.
- Annually monitor abundance, productivity, distribution, and trends of migratory shorebird, bald eagle, osprey (biannually), peregrine falcon, black rail and northern harrier (biannually or more), colonial waterbird, and coastal rail populations.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Monitor weight gains of red knot and migratory shorebird populations during the stopover period. Monitor horseshoe crab egg density in relation to regulatory and habitat conditions.
- Monitor nesting density and productivity of red knots at Arctic breeding grounds.
- Monitor population trends of red knots at wintering grounds in Bahia Lomas, Chile, and in Argentina.
- Monitor species abundance of migratory raptors at key locations to determine trends in migration counts. Sponsor "Hawk Watches" during the fall migration.
- Measure population changes of reptiles and amphibians through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project, focusing on special concern reptiles, Eastern tiger salamander, Cope's gray treefrog, and vernal pool obligate and facultative species, species that depend wholly or significantly on vernal pools for breeding.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

5. Cape May Peninsula

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring success

a. Habitats

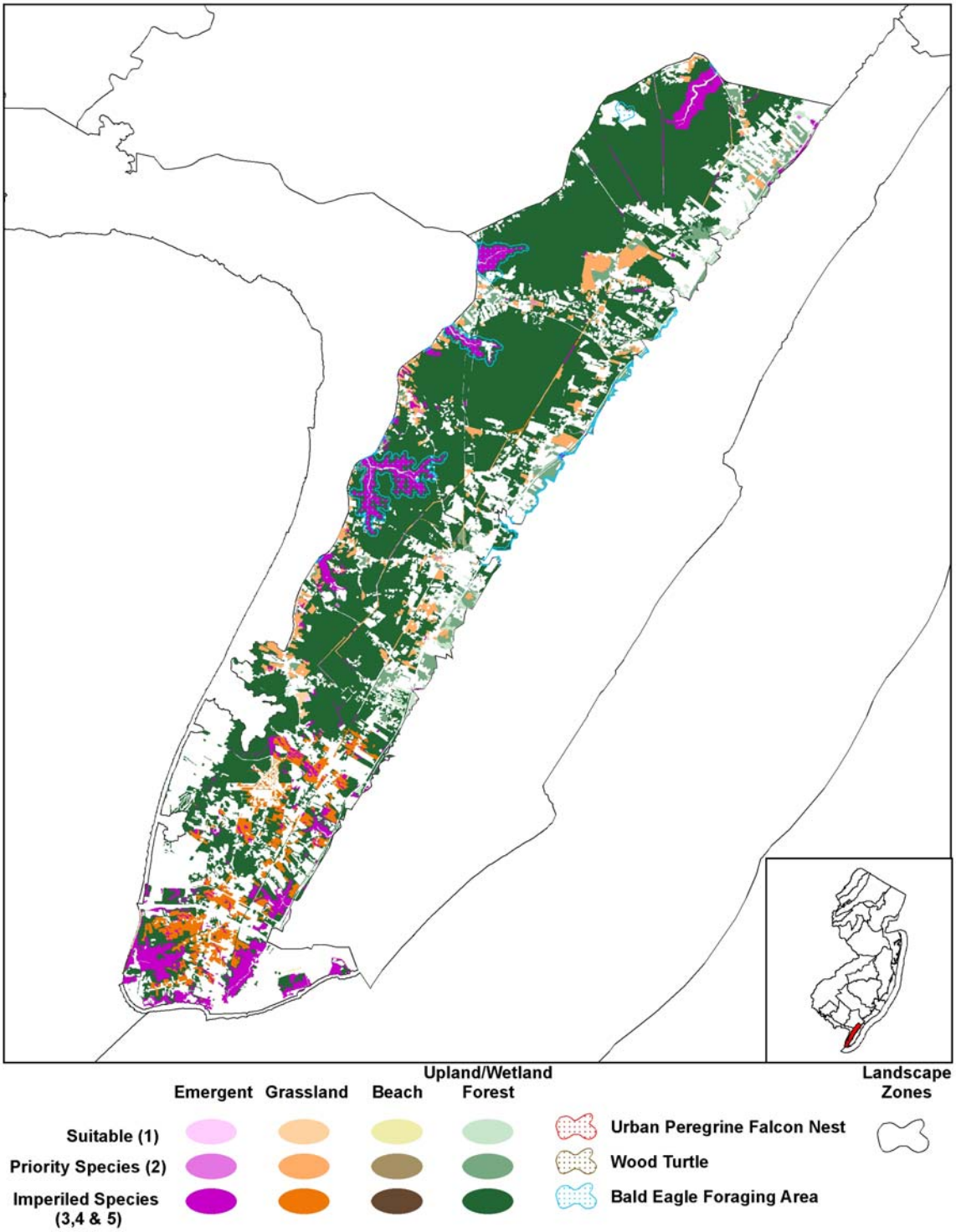
The Cape May Peninsula zone includes inland Cape May County (excluding the Coastal Landscape region to the east and the Delaware Bay shoreline to the west), spanning from the southern tip of Cape May to portions of Dennis and Upper townships to the north (Figure 16). Due to its geography, the peninsula's habitats comprise a nationally-important area of the Atlantic Flyway in the way migratory birds are funneled toward the Delaware Bay. It also holds populations of rare wildlife that are limited to this far southern reach of the state. Habitats range from the beaches of the Cape May Point area to native dune forests at Higbee Beach, mixed upland forest, and the wetland forest of Beaver Swamp and Cape May NWR. A corridor of upland and wetland forest persists in the center of the peninsula. Patches of fields persist on the peninsula adjacent to both forest and marsh.

Important conservation areas include Higbee Beach WMA, parts of Cape May Point State Park and Cape May Meadows Preserve, Beaver Swamp WMA, Cape May NWR-Great Cedar Swamp Division, and Lizard Tail Swamp preserve. Some lands are also held by the water supply authority in Middle Township, including part of the valuable Fishing Creek headwaters. The county park system includes the Fishing Creek freshwater marsh in Lower and Middle townships, and upland forests in Middle and Upper townships.

b. Wildlife of Greatest Conservation Need

The nationally-important migration of raptors, songbirds, and American woodcock through the peninsula represent some of the zone's most notable wildlife. In addition, species inhabiting the peninsula include the state endangered bald eagle, red-shouldered hawk, northern harrier, peregrine falcon, Cope's gray treefrog, and eastern tiger salamander. State threatened species include the barred owl, black-crowned night-heron, bobolink, Cooper's hawk, osprey, red knot, red-headed woodpecker, northern pine snake, Pine Barrens treefrog, and frosted elfin. Special concern wildlife include forest raptors and passerines, freshwater wetland birds, foraging coastal and freshwater marsh birds, grassland birds (primarily on the grounds of Cape May Airport), migratory shorebirds, eastern box turtle, eastern king snake, carpenter frog, Fowler's toad and marbled salamander. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, occur on the Cape May Peninsula. Maintaining the priority wildlife habitats, particularly those for migratory and forest birds, will adequately protect habitats for most of the rare wildlife populations; however, special attention is needed to maintain and recover the eastern tiger salamander and Cope's gray treefrog. Tables DB36 – DB42 identify the species of greatest conservation need within this zone.

Figure 16. Critical landscape habitats within the Cape May Peninsula conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Cape May Peninsula

Table DB36. Federal Endangered Species*

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Currently no federal listed species are located in this conservation zone					

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
X: Species occurs within the identified habitat.

Table DB37. State Endangered Species

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Birds					
Bald eagle		X			X
Loggerhead shrike				R	
Northern harrier			X	X	
Peregrine falcon			X		
Pied-billed grebe			X		
Red-shouldered hawk					X
Amphibians					
Cope's gray treefrog			X		X
Eastern tiger salamander			X		X

R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table DB38. State Threatened Species

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Birds					
Barred owl					X
Black-crowned night heron			X		
Bobolink				X	
Cooper's hawk					X
Osprey			X		
Red knot		X			
Red-headed woodpecker					X
Yellow-crowned night heron			X		X
Reptiles					
Northern pine snake					X
Amphibians					
Pine Barrens treefrog					X
Insects					
Frosted elfin				X	X

X: Species occurs within the identified habitat.

Table DB39. Nongame Species of Conservation Concern

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals					
Eastern red bat					X*
Eastern small-footed myotis					X*
Hoary bat					X*
Silver-haired bat					X*
Eastern red bat					X*
Birds					
Acadian flycatcher					X
American kestrel				X	
American oystercatcher			X		

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)					
Baltimore oriole					X
Blackburnian warbler					X
Black-and-white warbler					X
Black-billed cuckoo					X
Black-throated green warbler					X
Blue-winged warbler					X
Broad-winged hawk					X
Brown thrasher					X
Cattle egret			X	X	
Chimney swift				X	
Chuck-will's-widow					X
Common barn owl				X	
Common tern			X		
Eastern kingbird				X	X
Eastern meadowlark				X	
Eastern screech-owl					X
Eastern towhee					X
Eastern wood-peewee					X
Field sparrow				X	
Forster's tern			X		
Glossy ibis			X		
Gray catbird				X	X
Great blue heron			X		
Great crested flycatcher					X
Great egret		X	X		
Green heron			X		
Hooded warbler					X
Horned lark			X		
Indigo bunting				X	
Kentucky warbler					X
King rail			X		
Least bittern			X		
Least tern		X	X		
Louisiana waterthrush					X
Marsh wren			X		
Northern flicker					X
Northern parula					X
Pine warbler					X
Prairie warbler					X
Prothonotary warbler					X
Saltmarsh sharp-tailed sparrow			X		
Scarlet tanager					X
Seaside sparrow			X		
Sharp-shinned hawk					X
Snowy egret			X		
Tricolored heron			X		
Whip-poor-will					X
Willow flycatcher					X
Wood thrush					X
Worm-eating warbler					X
Yellow-billed cuckoo					X
Yellow-breasted chat					X
Yellow-throated vireo					X
Yellow-throated warbler					X
Reptiles					
Eastern box turtle					X
Eastern king snake					X
Spotted turtle			X		
Amphibians					
Carpenter frog			X		X
Fowlers toad			X		X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Amphibians (continued)					
Marbled salamander			X		X
Insects					
A noctuid moth, *Cucullia alfarata*				X	
Maritime sunflower borer, *Papaipema maritima*			X	X	
Precious underwing, *Catocala pretiosa pretiosa*					X
Rare skipper, *Problema bulenta*					X
Fish					
Atlantic sturgeon	X				

*Potential presence.
X: Species occurs within the identified habitat.

Table DB40. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Birds					
American black duck	X		X		
American woodcock			X		X
Black scoter	X				
Bufflehead	X		X		
Canada Goose (Atlantic population)	X		X		
Clapper rail			X		
Long-tailed duck	X				
Northern bobwhite				X	X
Northern pintail	X		X		
Surf scoter	X				
Virginia rail			X		
White-winged scoter	X				
Wood duck			X		

X: Species occurs within the identified habitat.

Table DB41. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table DB42. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Beach	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals					
River otter	X		X		
Birds					
Sora rail			X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Cape May Peninsula

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Wildlife and their associated habitats within Cape May Peninsula are under severe pressure from development: 40 percent of wildlife habitat was lost between 1975 and 1995 due to development as this area's resorts continue to grow rapidly. Additional losses occur due to fragmentation associated with development, degrading habitat for migratory raptors, forest passerines, and nearly all forest and field-dependent birds. Development also destroys and degrades wetland habitats, leading to water quality declines, the proliferation of deleterious invasive plants, and pressure on groundwater resources that impact eastern tiger salamander and Cope's gray treefrog populations. Encroachment from development and recreational activities negatively impact nesting and foraging bald eagles and ospreys. Cavity-nesters are threatened by loss of large trees and competition from invasive birds, while scrub-shrub birds are threatened by competition and loss of suitable habitats to intensive land uses. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Protect, enhance, and restore forest and field habitats to provide feeding, resting and roosting resources for migratory raptors, passerines, American woodcock, and butterflies and moths. The habitat matrix to be maintained is dominated by forest (upland and wetland) but includes fields in various stages of succession and agricultural use.
- Protect and enhance critical wetland habitats as identified by the Landscape Project: wetlands in the lower peninsula for migratory shorebird populations; coastal marsh birds, and colonial waterbirds; and forested wetlands for freshwater wetland birds, Cope's gray treefrog, eastern tiger salamander, and special concern amphibian populations.
- Inventory and monitor, and determine distribution and habitat requirements, of the autumn-migration birds, forest-dependent resident birds, and listed and special concern amphibians and reptiles of the peninsula, and of rare fish species.
- Prevent, stabilize, and reverse declines of coastal marsh birds, colonial waterbirds, freshwater wetland birds, scrub-shrub birds, listed and special concern amphibians, listed butterfly and moth species, and endangered, threatened, and special concern fish species such as the Atlantic sturgeon and hickory shad.
- Monitor, maintain, and enhance populations of breeding, migratory and wintering waterfowl of conservation concern.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness of wildlife conservation.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Delaware Bay Regional Landscape stakeholders during a meeting held on September 12, 2007 (see *Attachment J*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
1°	Develop, implement, and evaluate best management practices and guidelines to maintain, enhance, and/or restore habitat on public and private lands with significant habitats for resident and migratory forest raptors and passerines, as well as other listed species. *(Conserve wildlife – rare wildlife)*
1°	Revise existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
1°	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat value for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2°	Increase the effective size and connectivity of critical habitats supporting species of conservation concern on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of critical habitats and target these areas for acquisition to maintain a system of large, connected tracts within and between conservation zones. Where possible, enhance and restore habitats through revegetation and management practices as appropriate (e.g., grasslands, prescribed burns and appropriate mowing strategies with little or no impact to forested and wetland dependent species of greatest conservation need; forests, appropriate silviculture practices). Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Acquire habitat through direct purchase or easements and enlist private lands in preservation and management programs that offer long-term stability. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project; Agriculture – land management)*
2°	Use GIS, other remote sensing tools, and surveys to identify and map significant natural vegetative communities that may host wildlife species of conservation need, particularly on public lands and lands that serve as wildlife corridors. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing upland fields and forests and wetland forests for resident and migratory birds, and vernal pools, wetlands, and surrounding uplands that support tiger salamander and gray treefrog sites and metapopulations. Develop landowner cooperative agreements to protect significant freshwater wetland bird sites and vernal pools where they occur. *(Protect habitat – migratory birds, Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
Protect critical habitats for migratory wildlife (birds, bats, and Lepidoptera)	
1º	Increase the area of forest managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling and scrub-shrub/ open-field species (e.g., woodland raptors, pine snakes, black-throated green warbler, and woodcock, butterflies, moths, yellow-breasted chat, blue-winged warbler, brown thrasher). • These forest types to include but are not limited to: an uneven-age structure; mature forests with 65-95% canopy closure and structural diversity; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). • All areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create optimal habitat for barred owl and red-shouldered hawk. • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Develop, implement, and evaluate best management practices to protect, enhance, and restore upland habitat to maintain the migration of raptor and passerine populations at viable levels. Develop an action plan for immediate implementation should habitat levels fall below the minimum necessary to sustain the migration. Actively manage state and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*
1º	Use GIS, other remote sensing tools, and surveys to identify critical habitats for bald eagles (resident and migratory), and critical stopover habitats for migratory birds, bats, and Lepidopteran species, assess their condition, and maintain information. Identify habitat requirements and monitor trends in habitat change to develop protection strategies and best management practices (e.g., regulations, land acquisition, incentive programs) to maintain the migration at viable levels for species populations. *(Protect habitat – migratory birds; Landscape Project)*

Priority	Conservation Actions (continued)
2º	Identify best management practices for scrub-shrub and field birds, and implement them on conservation lands in the peninsula. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*
2º	Develop, implement, and evaluate best management practices for powerlines and other rights-of-way for the conservation of rare butterflies and moths. *(Conserve wildlife – rare wildlife)*
Protect critical wetland habitats as identified by the Landscape Project	
1º	Maintain and enhance upland and floodplain forests on private and public lands for forest birds by promoting contiguous forests and discouraging fragmentation. *(Conserve wildlife – rare wildlife; Corridors – migratory birds; Protect habitat – migratory birds)*
1º	Develop, implement, and evaluate best management practices to protect, enhance, and restore freshwater wetland habitats to maintain the migration of raptor and passerine populations at viable levels. Actively manage state and other conservation lands to enhance contiguous wetlands and wetland networks for forest birds and Lepidopteran species, and discourage the loss of wetland habitats through filling, nutrient loading, or contamination. *(Protect habitat – Landscape Project, migratory birds; Corridors – migratory birds)*
1º	Develop, implement, and evaluate best management practices and guidelines to maintain, enhance, and/or restore marsh habitat (e.g., mosquito control, rights-of-way management) and freshwater wetland habitat (e.g., mitigation wetlands). *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices to enhance and/or restore aquatic and adjacent riparian habitats supporting populations of special concern and rare fish such as by removing obstructions to fish passage in rivers and streams. *(Protect habitat – fish; Monitor wildlife - fish)*
1º	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Restablish/restore historically important submerged aquatic vegetation beds in Delaware Bay tributaries to benefit waterfowl and waterbirds. *(Conserve wildlife – game species)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl, rare wildlife, fish; Enhance habitat – private lands)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*

Priority	Conservation Actions (continued)
1º	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
2º	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl, and include in marsh BMPs and species dependent on mudflats and impoundments. *(Conserve wildlife – rare wildlife, game species)*
2º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species. *(Conserve wildlife – rare wildlife)*
Inventory, determine distribution, and monitor rare fish and wildlife	
1º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Monitor wildlife – fish; Protect habitat – Landscape Project)*
1º	Regularly survey (e.g., 5 years) suitable habitats to determine distribution and trend of migratory raptors and passerines and evaluate their habitat use patterns. *(Monitor wildlife – long-term monitoring)*
1º	Regularly survey suitable habitats for E. tiger salamander and S. (Cope's) gray treefrog to monitor population size, trends, productivity, and suitability of habitats. *(Conserve wildlife – rare wildlife)*
1º	Monitor American woodcock populations through surveys conducted every five years; review available survey data in the peninsula, assess habitat use and habitat condition to determine species status and management needs. *(Conserve wildlife – game species)*
1º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by FishTrack Database. *(Status – fish)*
1º	Identify and research water quality parameters for eastern tiger salamander, Cope's gray treefrog, and other vernal pool amphibian populations. Investigate the effects of chemical mosquito control on amphibian, dragonfly, and damselfly populations. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
2º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks), northern saw-whet owls, and Eastern screech-owls. *(Conserve wildlife – rare wildlife; Monitor wildlife – long-term monitoring)*
2º	Conduct sampling (e.g., mist netting) to determine distribution, range, migratory pathways, and habitat use of summer bats. Long-term sampling of forest dwelling bat species should be conducted to determine population trends and species response to changes in habitats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring*

Priority	Conservation Actions (continued)
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
Prevent, stabilize, and reverse declines of populations of colonial waterbirds, freshwater wetland birds, scrub-shrub birds, Lepidoteran (butterflies and moths) species, and rare fish species	
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitat, including causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, contaminants, food availability, hybridization, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement proactive habitat conservation goals that will meet and maintain the recovery needs of all endangered and threatened wildlife and fish populations, particularly for the landbird migration through the peninsula that also addresses forest-interior bird nesting requirements. These include guidelines for forest silviculture on public and private lands to enhance forest maturity and canopy, and replanting to reduce fragmentation. *(Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate proactive habitat conservation goals that will meet and maintain the recovery needs of the eastern tiger salamander, Cope's gray treefrog (consistent with the plan for Northeast Amphibian and Reptile Conservation), and freshwater wetland birds (consistent with the North American Waterbird Conservation Plan).
1º	Research the habitat requirements to maintain both migratory and resident forest birds in the peninsula in a quantified way, and develop, implement, and evaluate planning and management strategies to maintain or reach those levels. *(Conserve wildlife – rare wildlife; Protect habitat – migratory birds)*
1º	Research the terrestrial habitat requirements for Cope's gray treefrog and eastern tiger salamander, and recommend appropriate management and regulations based on the results. Investigate habitat requirements to sustain meta-populations. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g., implementing wildlife underpasses, road closures). *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
Monitor, maintain, and enhance populations of breeding, migrating and wintering waterfowl of conservation concern	
1º	Use GIS, other remote sensing tools, and surveys to identify critical aquatic and wetland habitats and assess their condition for migratory and wintering waterfowl, finfish, and shellfish populations of conservation concern. Take action to minimize habitat loss by restoring, enhancing, and/or protecting habitat on public and private lands through protection strategies (e.g., acquisition, landowner incentives) and to maintain/ enhance existing waterfowl habitat where such management complements rare species management. *(Conserve wildlife – game species)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Conserve wildlife – game species; Monitor wildlife – long-term monitoring)*
2º	Determine carrying capacity of area marshes for wintering American black ducks to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. *(Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, other remote sensing tools, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Work with appropriate government agencies to survey and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the southern pine beetle, orange-striped oakworm, gypsy moth, and oak lace bug. Take appropriate control methods to reduce tree damage and limit the spread of infestations, provided such methods avoid excessive direct or indirect harm to non-target species. *(Conserve wildlife – invasives)*
1º	Use appropriate measures to control the spread of phragmites (common reed) and restore native wetland vegetation to areas like Pond Creek. *(Restore aquatic habitat – development)*
1º	Work with public and private landowners and managers and regulatory agencies to employ physical, chemical, or biological control measures, or a combination of these, to reduce invasive, non-indigenous plants in areas that are identified as providing critical habitat for endangered, threatened or priority wildlife species that are being threatened such plants. *(Conserve wildlife – invasives)*
1º	Develop, implement, and evaluate management strategies to reduce the impacts of mute swan herbivory on native vegetation in impoundments and marshes of the Cohansey River supporting species of conservation concern. *(Conserve wildlife – invasives)*
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*

Priority	Conservation Actions (continued)
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer. *(Conserve wildlife - deer)*
Protect and enhance important and unique habitats	
1º	Recognize, protect and enhance all undeveloped habitats in the southern 30 km of the peninsula for long term protection of migrations (with priority for larger and contiguous patches). Contiguous habitats in the 30 km as well as the marsh-forest edge along both the Atlantic and Delaware Bay coastlines are unique and essential for the international migrations. *(Protect habitat – migratory birds; Corridors – migratory birds; Conserve wildlife – rare wildlife)*
1º	Recognize and enhance protection of other significant wildlife habitats including the drainages of Fishing Creek, Dias Creek, Bidwell Creek, Dennis Creek and Cedar Swamp Creek, which include the larger wetland forest tracts of the peninsula. *(Protect habitat – migratory birds; Corridors – migratory birds; Conserve wildlife – rare wildlife)*
1º	Recognize and enhance protection of the significant wildlife habitats of Higbee Beach Wildlife Management Area, Cape May Point State Park, and Cape May Meadows, as unique and essential habitats for migratory fauna. *(Protect habitat – migratory birds; Corridors – migratory birds; Conserve wildlife – rare wildlife)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Corridors – migratory birds; Protect habitat – migratory birds, Landscape Project)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.

Priority	Conservation Actions (continued)
Promote public education and awareness and wildlife conservation	
1º	Develop, maintain, and enhance opportunities for ecotourism on the Cape May Peninsula in a manner consistent with wildlife and habitat enhancement including but not limited to the creations of interpretive trails, the creation of viewing areas, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop and maintain education brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education – humans)*
2º	Educate the public about the importance of the habitats within this zone to the Atlantic coast bird, bat, and Lepidopteran species' migration through newsletters, press releases, brochures, presentations, and web pages. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*

Priority	Conservation Actions (continued)
2º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect and enhance forest and field habitats for migratory landbirds and forest nesting birds. Publish management guidelines for private landowners.
    - Utilize incentive programs that encourage the management of fields, scrub-shrub and forest patches.
    - Through incentive programs, target private landowners surrounding public natural lands to manage land for forests in order to increase effective size and connectivity of forest patches.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, The Nature Conservancy, Natural Lands Trust, and local municipalities for the conservation of fields, scrub-shrub and forest patches.
    - Work with landowners to maintain/enhance existing habitats where listed special concern fish species occur.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups (NJ Audubon Society, The Nature Conservancy-NJ Chapter, NJ Conservation Foundation) and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations.
    - Involve Citizen Scientists in management projects, such as posting refuges to prevent disturbance.
- Promote backyard habitat management for migratory raptors and passerines, concentrating on the most southern 20 km (12.4 miles) of the peninsula.

Wildlife Professionals

- Identify conservation actions in other states with significant migration stopovers and corridors that might be applied to the Cape May Peninsula. Work on a mid-Atlantic and Atlantic Flyway regional basis for conservation of habitats.

Academic Institutions

- Partner with Rutgers and other academic institutions to conduct studies necessary to better understand the impacts of deer on biodiversity, forest health, and ecosystem processes and to develop habitat-specific or landscape-specific deer density targets.

Conservation Organizations

- Partner with watershed and conservation organizations such as NJ Audubon Society (NJAS) NJ Conservation Foundation (NJCF) and The Nature Conservancy (TNC) to protect and enhance habitats for rare species.
    - Enhance habitat for eastern tiger salamander, Cope's gray treefrog, and forest birds in suitable areas (e.g., Lizard Tail Swamp).
- Work with conservation organizations such as NJ Audubon Society to develop educational programs and provide training in backyard habitat management.
- Work with organizations such as NJ Audubon Society to promote wildlife festivals in the region.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, NJCF, TNC, State Agricultural Development Committee Farmland Preservation, and local land trusts.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs, and other conservation programs.
- Work with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USDA-NRCS, USFWS, and the DCA, Office of Smart Growth to protect, enhance, and create habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection (DEP) Division of Fish and Wildlife (DFW) and USFWS to work together at Cape May NWR and WMAs to enhance refuge habitat for forest interior nesters and migratory landbirds.
    - DFW will work with the DEP's Land Use Regulation Program (LURP) and other DEP programs to protect habitats critical to the landbird migration and to adapt regulatory protection as necessary.
    - DFW and DPF to work with the DEP's Office of Natural Lands Management, Natural Heritage Program (NHP) to develop mapping of significant natural vegetative communities, particularly on public lands and lands that serve as wildlife corridors, to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
    - DFW and DPF to collaborate on forest management guidelines to achieve forest management goals for listed and rare wildlife, on both public and private lands.
    - DFW will lead law enforcement efforts to limit public access and disturbance to bald eagle nesting areas.
    - DFW will lead investigation of marine conservation zone planning as a tool to protect coastal marsh bird nesting and foraging areas.

- DFW and conservation organizations to work with LURP to protect vernal pools and appropriately classify wetlands for listed and rare amphibians.
- Expand efforts to create habitat and implement best management practices for forest-interior and migratory birds, and coastal marsh birds on Wildlife Management Areas and with natural resource managers, county and municipal utility authorities, and planners. Develop and implement BMPs for scrub-shrub birds in areas of existing fields on Higbee Beach and Dennis Creek WMAs.
- DFW will create vernal pools on state lands where they may serve to increase existing habitat for eastern tiger salamander and Cope's gray treefrog.
- DFW to lead in the development of specific conservation plans for special concern reptiles and amphibians on state lands.
- DFW to work with state and county mosquito commissions to measure the effects of, and prevent declines due to, the use of insecticides and biological controls at known amphibian breeding sites.
- DFW, and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
- DFW to work with LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to work with USFWS and other state, federal, and non-governmental partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan as appropriate, seeking areas where such management complements rare species management.
- DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with federal and state agencies, including USFWS, USCG, National Oceanic and Atmospheric Administration, NJ Bureau of Emergency Response, and NJ Office of Natural Resources Restoration (NRCS), to plan for and assist with emergency oil spill response.
- DFW and DPF to work with the USFWS to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife, Japanese sedge and other invasive plants in critical wildlife habitats.
- DFW to determine groundwater recharge areas for Cope's gray treefrog and E. tiger salamander breeding pools with the Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water levels and quality, and conduct hydrological monitoring in these areas.

- DFW to lead in the development of educational materials for the public and private landowners about the Cape May fall migration, essential habitats, and the potential harmful effects of disturbance on nesting and resting birds.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs, wildlife viewing opportunities, and wildlife festivals.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee Farmland Preservation, local land trusts, and through mitigation.
- Support the completion of land acquisition in the US Fish and Wildlife Service's Cape May National Wildlife Refuge acquisition boundary, and expansion of that boundary (per Cape May NWR Comprehensive Conservation Plan, 2004).
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at federal, state, and local levels.

g. Monitoring Success

- Assess habitat quantity and monitor habitat changes over time; measure bird use of different habitats, including managed and unmanaged sites to monitor efficacy of habitat management and restoration efforts.
- Regularly monitor abundance, distribution, and trends of migrating landbirds, forest-interior birds (barred owls, red-shouldered hawks, Cooper's hawks), ospreys, tidal and freshwater marsh birds, colonial waterbirds, and migratory shorebirds. Monitor productivity of forest-nesting birds via an index to be developed.
- Regularly monitor the resident bald eagle population and habitat use.
- Monitor weight gains of red knot and migratory shorebird populations during the stopover period. Monitor red knot habitat use relative to habitat type and horseshoe crab egg density.
- Monitor nesting density and productivity of red knots at Arctic breeding grounds.
- Monitor population trends of red knots at wintering grounds in Bahia Lomas, Chile, and Argentina.
- Monitor species abundance of migratory raptors at key locations to determine trends in migration counts.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project, focusing on special concern reptiles, Eastern tiger salamander, Cope's gray treefrog, and vernal pool obligate and facultative species, species that depend wholly or significantly on vernal pools for breeding. Measure population fluctuations at both managed and unmanaged sites.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

Piedmont Plains Landscape

Contents of the Chapter on the Piedmont Plains Landscape

The Piedmont Plains landscape spans a diagonal zone across New Jersey from the southwest and the Delaware River estuary to the northeast at Sandy Hook and north to the Palisades. This expansive landscape runs across Salem, Gloucester, Camden, Burlington, Mercer, Monmouth, Middlesex, Somerset, Morris, Union, Essex, Hudson, and Bergen counties. The Delaware, the Raritan, and the Hudson are the prominent rivers and watershed regions in the Piedmont Plains.

A. Ecological Units in the Piedmont Plains

The U.S. Forest Service has developed a map of regional ecological units of the United States (Bailey, 1997) and the first iteration of a map that divides the eastern United States into subregional ecological units (Keys and others, 1995). The ecological units represent ecoregions that are distinct associations of interconnected physical and biological features. The eastern United States is divided into three regional levels – domains, divisions, and provinces – and two subregional levels – section and subsection.

According to Keys and others (1995), New Jersey is within the Humid Temperate Domain, and divided between the Hot Continental Division and the Subtropical Division. The Hot Continental Division includes the Eastern Broadleaf Forest Province and the Lower New England (221A), Hudson Valley (221B), and Northern Appalachian Piedmont (221C) Sections. The Subtropical Division in New Jersey includes the Outer Coastal Plain Mixed Forest Province and the Middle Atlantic Coastal Plain Section (232A).

U.S. Forest Service Ecological Units in the Piedmont Plains
The Piedmont Plains is within the Middle Atlantic Coastal Plain and the Northern Appalachian Piedmont Sections and contains the New Jersey Inner Coastal Plain (232Ac) and the Gettysburg Piedmont Lowland (221Da) and Newark (221Dc) subsections.

B. Geology and Climate

The Piedmont Plains landscape includes the Coastal Plain and Piedmont physiographic provinces of New Jersey. The New Jersey Inner Coastal Plain is within the Coastal Plain physiographic province and the subsection consists of terraced lowlands rising to crest-like hills and varies in elevation from sea level to 119 meters (390.4 feet). The Gettysburg Piedmont Lowland and Newark subsections are within the Piedmont physiographic province and are characterized by rolling hilly lowlands dissected by broad, winding river valleys with well-developed floodplains. Distinctly higher, rocky ridges and hills of basalt and diabase, such as the Palisades, disrupt the contours in the Piedmont Plains landscape. The average temperature varies from 10.5 to 12.2ºC (51 to 54ºF) and there are typically 165 to 225 days when the air temperature above 32ºF (the growing season). The average annual precipitation is between 101.6 and 116.8 centimeters (40 and 46 inches).

C. Habitats and Conservation Zones of the Piedmont Plains Landscape

The Piedmont Plains Landscape received nearly half of all development that occurred in New Jersey during the period between 1984 and 1995 – approximately 45,000 hectares (177.6 sq. mi.). Cultivated/grasslands, wetland and upland forest, and estuarine emergent wetlands sustained the greatest losses.

Although extensive loss and fragmentation of grassland and forest habitats has increased the prevalence of smaller habitat patches, the Piedmont Plains Landscape (Figure 17) still has extensive grasslands and agricultural areas (115,537 hectares, 446 sq. mi.), fragmented deciduous and mixed deciduous-coniferous woodlands of pine-oak, mixed-oak, oak-hickory, and hardwood swamps (107,848 hectares or 416.4 sq. mi. of forest, 74,866 hectares or 289 sq. mi. of forested wetlands), tidal freshwater and brackish marshes (40,954 hectares or 158.1 sq. mi of wetlands), and extensive riparian areas through the entire landscape. It is important to note that habitats identified as “grassland” within the Landscape Map and throughout this document include agricultural lands and therefore, are not necessarily suitable habitats for grassland species. Similarly, scrub-shrub habitat is included in the “forest” and “forested wetlands” habitats on the Landscape Maps.

The Delaware, Raritan, and Hudson are the prominent rivers and watershed regions in the Piedmont Plains. The tidal tributaries and wetlands of the Delaware River are characterized by a brackish estuary, from the Cohansey River to Camden, and freshwater tidal wetlands, from Camden north to Trenton.

Eight of the 10 most populated cities and municipalities in New Jersey are located in the Piedmont Plains Landscape, including Newark, Jersey City, Elizabeth, Edison Township, Woodbridge Township, Hamilton Township, Trenton, and Camden (Table PP1).

Table PP1. The most populated cities in New Jersey according to the 2000 Census.

Most Populous Cities	Population (2000 Census)	Landscape Region
Newark	273,546	Piedmont Plains
Jersey City	240,055	Piedmont Plains
Paterson	149,222	Piedmont Plains
Elizabeth	120,568	Piedmont Plains

Table PP1 (continued)

Most Populous Cities	Population (2000 Census)	Landscape Region
Edison Township	97,687	Piedmont Plains
Woodbridge Township	97,203	Piedmont Plains
Dover Township	89,706	Pinelands
Hamilton Township	87,109	Piedmont Plains
Trenton	85,403	Piedmont Plains
Camden	79,904	Piedmont Plains

This highly urbanized and developed region also serves as the transportation corridor between Pennsylvania and New York.

Most critical wildlife habitats are widely dispersed between the Delaware River estuary, the grasslands of the inner coastal plain, rolling hills of the piedmont, the beaches and dunes of Sandy Hook, and the cliffs of the Palisades.

The Priority Conservation Zones in the Piedmont Plains Landscape are:

(1) Northern Piedmont Plains
(2) Raritan Bay and North Atlantic Coast
(3) Central Piedmont Plains
(4) Southern Piedmont Plains

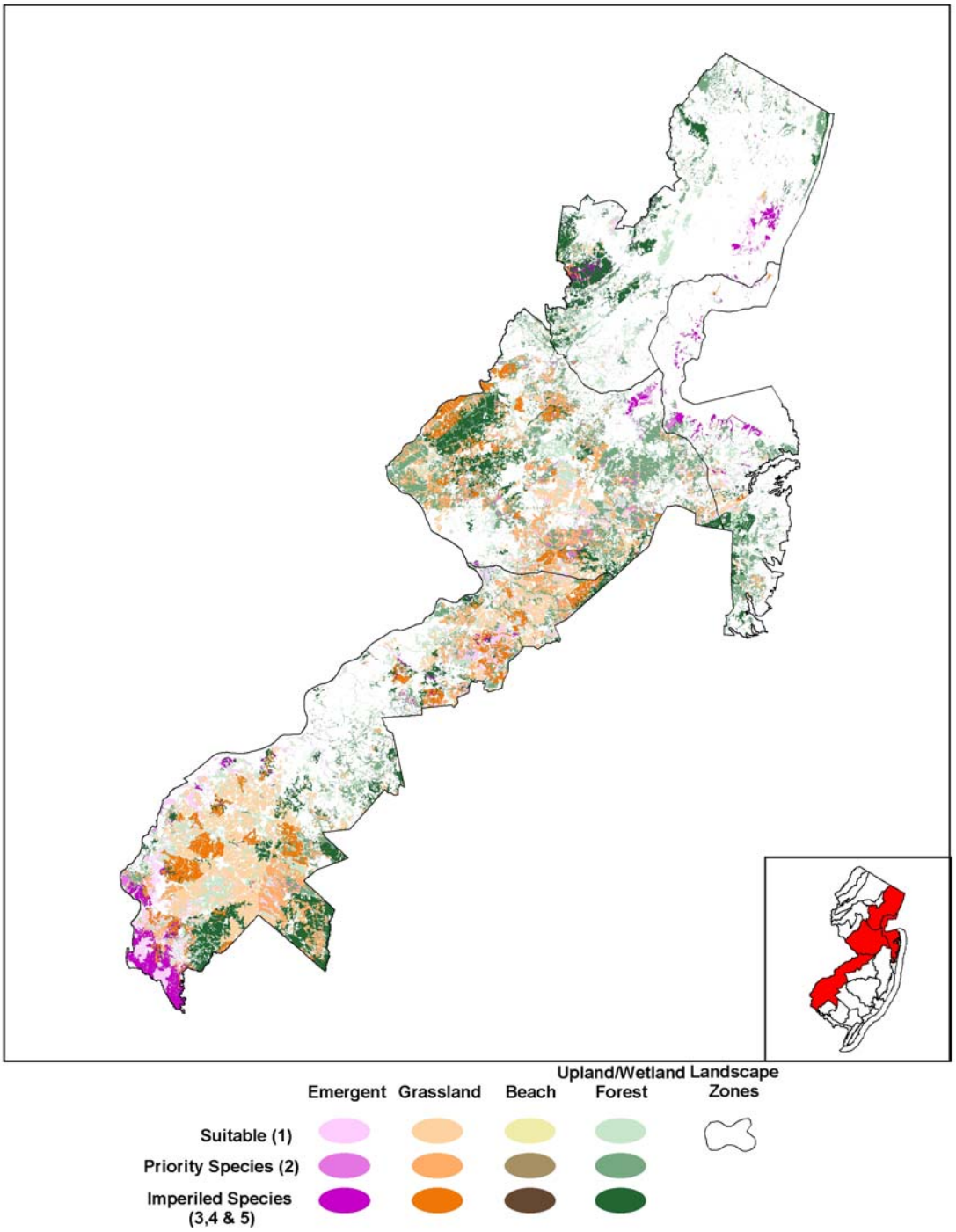
D. Wildlife of Greatest Conservation Need of the Piedmont Plains Landscape

Successful management of the Piedmont Plains Landscape is essential to conservation of several species including bald eagles, colonial waterbirds and freshwater wetland birds that inhabit riparian forests, brackish and freshwater wetlands. Robust grassland bird communities exist in the Southern Piedmont Zone. The eastern pondmussel and triangle floater inhabit the network of rivers found throughout this landscape. The Palisades Interstate Park is the last stronghold of the Allegheny woodrat in New Jersey, and the Northern Piedmont and the Raritan Bay and North Atlantic Coast are important for recovering populations of peregrine falcon and osprey.

Invasive, non-indigenous species often cause substantial ecological and economic problems. They frequently have competitive advantages because of the absence of predators, diseases and competitors that they typically evolve within other ecosystems or because of more efficient mechanisms of reproduction, dispersal or use of resources. They occur in every broad habitat type that occurs in the state. Invasive, non-indigenous plants threaten species diversity, composition and structure of our fields, forests, wetlands and aquatic habitats. Invasive, non-indigenous invertebrates such as zebra mussels and Asiatic (or Asian) clams have the potential to adversely impact aquatic habitats and species. Plants like Eurasian water-milfoil and vertebrates such as the northern snakehead threaten our aquatic resources and habitats. Emerald ash borer and Asian longhorn beetles have the potential to cause severe damage to our forests and wildlife habitat. Diseases such as West Nile virus have already had an impact on certain avian species.

Although heavily suburbanized, the Central and South Piedmont Plains has significant habitat for bog and wood turtles whose remnant populations are supported in fragmented grassland and

Figure 17. Critical landscape habitats within the Piedmont Plains Landscape and associated conservation zones as identified through the Landscape Map (v2).



woodland. Large forest tracts are important for breeding forest passerines and raptors and remnant populations of bobcat. The patchwork of habitats in this Landscape (forests, grasslands, wetlands, riparian areas) provides critical stopover sites for migratory birds to rest and refuel. The region's forests and riparian areas are also known to host populations of forest-dwelling bats and contain habitat suitable for summer colonies of Indiana bats.

Judicious management of the Piedmont Plains Landscape is essential to conserve some of the most significant natural areas in New Jersey: the Palisades, Great Swamp National Wildlife Refuge, the Meadowlands, Preakness Mountain, and Sourland Mountain. These areas support unique and intact ecosystems that are in jeopardy from surrounding land uses and other human impacts.

Finally, the Piedmont Plains Landscape is a critical transition area between the northern deciduous forest ecosystem of the Skylands Landscape and the southern coastal plain ecosystem of the Pinelands Landscape. Retaining and enhancing connectivity between these two landscapes is an important goal in the Piedmont Plains.

The Piedmont Plains supports two federal endangered or threatened species and potentially three other federally listed species, 22 state endangered species, 22 state threatened species, and 123 special concern and regional priority wildlife species. Federally listed species include the bald eagle, bog turtle, and dwarf wedgemussel and state endangered species include the Allegheny woodrat, bobcat, American bittern, peregrine falcon, and eastern tiger salamander. In addition, the American burying beetle, shortnose sturgeon, and summer populations of the federal endangered Indiana bat are suspected to be located within the Piedmont Plains region. Among the state threatened species are the barred owl, red-headed woodpecker, savannah sparrow, Pine Barrens treefrog, and silver-bordered fritillary.

The following tables list the wildlife of greatest conservation need, the suites of wildlife, and the conservation opportunity areas to conserve them in the Piedmont Plains. The wildlife species are prioritized by federal endangered and threatened, state endangered, state threatened, and special concern/regional priority status.

Prioritized List of the Wildlife of Greatest Conservation Need and their Location in the Piedmont Plains Landscape

Table PP2. Federal Endangered and Threatened Species

Common Name	Federal Status & Regional Priority	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Mammals					
Indiana bat	E	R**	R**	R**	R**
Reptiles					
Bog turtle	T	I	I	I	I
Mollusks					
Dwarf Wedgemussel	E & RP			I	I
Insects					
American burying beetle♦	E	R	R		
Fish					
Shortnose sturgeon	E & RP			I	I

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦Only historic records exist. Species believed to be extirpated.
T: Federally threatened species.
E: Federally endangered species.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table PP3. State Endangered Species

Common Name	Regional Priority	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Mammals					
Allegheny woodrat		I			
Bobcat		I		I	I
Birds					
American bittern	RP	I		I	I
Bald eagle	T		I		I
Black skimmer	RP	I	R		
Henslow's Sparrow	RP	R	R		R
Least tern	RP	I	I		
Loggerhead shrike (migrant)	RP	I			
Northern goshawk		I			
Northern harrier		I	I	I	I
Peregrine falcon		I	I	I	I
Pied-billed grebe	RP	I	I	I	I
Red-shouldered hawk		I	I	I	I
Sedge wren	RP	I			I
Short-eared owl	RP				I
Upland sandpiper	RP		I	I	I
Vesper sparrow				I	I
Reptiles					
Timber rattlesnake				I	I
Queen snake					R
Amphibians					
Blue-spotted salamander		I		R	R
Eastern tiger salamander					I
Insects					
Appalachian grizzled skipper		R			
Bronze copper		R			I

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table PP4. State Threatened Species

Common Name	Regional Priority	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Birds					
Barred owl		I	I	I	I
Black-crowned night-heron	RP	I	I	I	I
Bobolink	RP	I		I	I
Cooper's hawk	RP	I	I	I	I
Grasshopper sparrow	RP	I	I	I	I
Long-eared owl		I		I	I
Osprey		I	I	I	I
Red-headed woodpecker	RP	I		I	I
Savannah sparrow		I	I	I	I
Yellow-crowned night-heron	RP	I	I		
Reptiles					
Northern pine snake			I		I
Wood turtle		I	I	I	I
Amphibians					
Eastern mud salamander				R	R
Long-tailed salamander		R		R	
Pine Barrens treefrog			I	I	I
Mollusks					
Eastern pondmussel					I
Tidewater mucket				R	R
Triangle floater				I	I
Yellow lampmussel				M	M
Insects					
Checkered white		R	I		
Frosted elfin				I	R
Silver-bordered fritillary				I	

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table PP5. Nongame Species of Conservation Concern

Common Name	Conservation Status	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Mammals					
Eastern small-footed myotis	RP	R**	R**	R**	R**
Eastern red bat	RP	R**	R**	R**	R**
Hoary bat	RP	R**	R**	R**	R**
Marsh rice rat	S3, G5	R	R	R	R
Silver-haired bat	RP	R**	R**	R**	R**
Southern bog lemming	RP	R	R	R	R
Birds					
Acadian flycatcher	RP	I	M	M	M
American golden-plover	RP	M		M	M
American kestrel	SC	I	I	I	I
American oystercatcher	RP		I		
Baltimore oriole	RP	I	I	I	I
Black-and-white warbler	RP	I	I	I	I
Black-billed cuckoo	RP	I	I	I	I
Blackburnian warbler	RP	I			
Black-throated blue warbler	RP	M		M	
Black-throated green warbler	SC	I	I	I	
Blue-headed vireo	SC	I	I		
Blue-winged warbler	RP	M	I	I	I
Broad-winged hawk	SC/RP	M	M	M	M
Brown thrasher	RP	M	M	M	I
Canada warbler	SC/RP	I	M	I	
Cattle egret	RP				M
Cerulean warbler	SC/RP	I		I	

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Birds (continued)					
Chimney swift	RP	I	I	I	I
Chuck-will's-widow	RP			R	R
Cliff swallow	SC	I		I	I
Common barn owl	SC	I	I		I
Common nighthawk	SC	I	M	M	M
Common tern	SC/RP		M		
Dickcissel	RP			M	M
Eastern kingbird	RP	I	I	I	I
Eastern meadowlark	SC/RP	I	I	I	I
Eastern screech-owl	RP	M	M	M	M
Eastern towhee	RP	I	I	I	I
Eastern wood-pewee	RP	I	I	I	I
Field sparrow	RP	I	I	I	M
Forster's tern	RP		M		M
Glossy ibis	RP		M		M
Golden-winged warbler	SC/RP	I			
Gray catbird	RP	M	M	M	M
Gray-cheeked thrush	SC	M			
Great blue heron	SC/RP	M	M	M	M
Great crested flycatcher	RP	M	I	M	I
Great egret	RP	M	M		M
Green heron	RP	I	M	I	I
Hooded warbler	RP	M	M	M	M
Horned grebe	RP		M		
Horned lark	SC		M	M	M
Indigo bunting	RP	I	I	I	I
Kentucky warbler	SC/RP	I	I	I	I
King rail	SC/RP	M			M
Least bittern	SC/RP	M	M	M	M
Least flycatcher	SC/RP	I	I	I	I
Little blue heron	SC/RP	I	I		I
Louisiana waterthrush	RP	M	M	M	M
Marsh wren	RP	M	M	I	I
Northern flicker	RP	M	M	M	I
Northern gannet	RP		M		M
Northern parula	SC	M	M	M	M
Pine warbler	RP	M	M	M	M
Prairie warbler	RP	I	I	I	I
Prothonotary warbler	RP	I		I	I
Purple finch	RP	R	R		R
Red-throated loon	RP		M		M
Rose-breasted grosbeak	RP	I	I	I	R
Saltmarsh sharp-tailed sparrow	RP	R	R	R	
Scarlet tanager	RP	M	M	M	I
Seaside sparrow	RP	R	R	R	R
Sharp-shinned hawk	SC/RP	M		M	M
Snowy egret	RP				I
Spotted sandpiper	SC	M	M	M	M
Summer tanager	RP	M	M	M	M
Veery	SC/RP	I	I	I	I
Whip-poor-will	RP		I	I	M
White-eyed vireo	RP	M	M	M	M
Willet	RP		M	M	M
Willow flycatcher	RP	I	I	I	I
Winter wren	SC	I		I	
Wood thrush	RP	I	I	I	I
Worm-eating warbler	RP	M	M	M	M
Yellow-billed cuckoo	RP	I	I	I	I
Yellow-breasted chat	SC/RP	I	I	I	I
Yellow-throated vireo	RP	M	M	M	I
Yellow-throated warbler	RP		M	M	M

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Reptiles					
Coastal plain milk snake	SC				M
Eastern box turtle	SC	M	M	M	M
Eastern kingsnake	SC				M
Northern copperhead	SC	M	M	M	
Northern diamondback terrapin	SC	M	M	M	M
Spotted turtle	SC	M	M	M	M
Amphibians					
Carpenter frog	SC			M	M
Fowler's toad	SC	M	M	M	M
Jefferson salamander	SC	M			
Northern spring salamander	SC	M	M		
Mollusks					
Creeper	SC				M
Insects					
Harris's checkerspot, *Chlosyne harrisii*	SC	M			
Clubtail dragonfly, *Gomphus septima*	S1, G2			M	
A noctuid moth, *Macrochila santerivalis*	S1S3, G3G4				M
Doll's merolonche, *Merolonche dolli*	S1S3, G3G4				M
A noctuid moth, *Chytonix sensilis*	S1S3, G4		M		M
Rare skipper, *Problema bulenta*	S2, G2G3				M
Lemmer's pinion moth, *Lithophane lemmeri*	S2, G3G4				M
A noctuid moth, *Cucullia alfarata*	S2, G4				M
Precious underwing, *Catocala pretiosa pretiosa*	S2S3, G4				M
A noctuid moth, *Macrochilo louisiana*	S2S3, G4				M
A slugmoth, *Monoleuca semifascia*	S2S3, G4G5				M
A spanworm, *Itame sp 1*	S3, G3				M
A noctuid moth, *Macrochilo sp 1*	S3, G3				M
Scarlet bluet, *Enallagma pictum*	S3, G3			M	M
Zanclognatha sp 1	S3, G3G4				M
Pink streak, *Faronta rubripennis*	S3, G3G4			M	M
Ringed boghaunter, *Williamsonia lintneri*	SH, G3	M			
Fish					
American brook lamprey***	RP	X	X	X	X
Atlantic sturgeon	SC* & RP			X	X
Bridle shiner	RP			X	X

*Federal species of special concern.
**Potential presence.
***Species is also recognized as target species of ecoregional concern by the Nature Conservancy - NJ Chapter
SC: Species of special concern as identified within the state.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
S & G: Conservation Ranks defined in Appendix I.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

Table PP6. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Regional Priority	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Birds					
American black duck	RP	I	I	I	I
American woodcock	RP	I	I	I	I
Atlantic brant	RP		M		
Black scoter	RP		R		
Bufflehead	RP		M		
Canada goose (Atlantic population)	RP	M	M	M	M
Canvasback	RP		I		I
Clapper rail	RP		M		M
Greater scaup	RP		I		I
Lesser scaup	RP		I		I
Long-tailed duck	RP		R		
Northern bobwhite	RP		R	R	R
Northern pintail	RP		I		I
Surf scoter	RP		R	R	R
Virginia rail	RP	R	R	R	R
White-winged scoter	RP		R		
Wood duck	RP	M	M	M	M
Fish					
Brook trout*		X			X

*Species is a New Jersey game species, but is also an excellent indicator of water quality.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

Table PP7. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Regional Priority	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Fish					
Comely shiner	-				X
Cutlips minnow	-	X			
Hickory shad	-			X	X
Ironcolor shiner	-				X
Margined madtom	-			X	X
Rainbow smelt	-				X
Shield darter	-		X	X	
Slimy sculpin	-	X			

X: Species present. Management strategy not yet determined.

Table PP8. Game Species

Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Regional Priority	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Mammals					
River otter	-	R	R	R	R
Birds					
Ruffed grouse	-	M	R	R	R
Sora	-	M	R	R	R
Fish					
Brown trout*	-	X			
Rainbow trout*	-	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

Table PP9. Suites of Wildlife and their Location in the Piedmont Plains Landscape

Common Name	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Mammals				
Forest-dwelling Bats	X	X	X	X
Birds				
Beach-nesting Birds		X		
Interior-forest Cavity-nesters	X	X	X	X
Savannah and Forest-edge Habitat Cavity Nesters	X	X	X	X
Coastal High Marsh Birds		X		
Coastal Low Marsh Birds	X	X		
Colonial Waterbirds	X	X	X	X
Forest Passerines	X	X	X	X
Freshwater Wetland Birds	X	X	X	X
Grassland Birds	X	X	X	X
Migratory Shorebirds		X		
Migratory Songbirds	X	X	X	X
Forest Raptors	X	X	X	X
Scrub-shrub/ Open Field (5-10 yrs) Birds	X	X	X	X
Early Succession (3 -5 years) Open Field Birds	X	X	X	X
Waterfowl	X	X	X	X
Reptiles				
Forest Dwelling Reptiles	X			
Reptile Inhabitants of Wetland, Marsh and Bog	X		X	X
Reptiles Associated with water (lakes, ponds, streams)	X		X	X
Reptiles of Special Concern	X	X	X	X
Amphibians				
Amphibians of Special Concern	X	X	X	X
Vernal Pool and Vernal Sinkhole Breeders	X		X	X
Non-vernal Sinkhole Inhabitants				
Limestone Fen Inhabitants	X			
Mollusks				
Mollusks of Special Concern			X	X

Suites of Wildlife and their Location in the Piedmont Plains Landscape (continued)

Common Name	Northern Piedmont	Raritan Bay	Central Piedmont	Southern Piedmont
Insects				
Lepidoptera of Federal or State Legal Status				
Lepidoptera of Special Concern	X		X	X
Odonata	X		X	X

X: Species occurs within the identified habitat.

E. Threats

The Piedmont Plains Landscape since 1972 has undergone extensive development, which has been accompanied by extensive habitat loss and fragmentation. Habitat loss and fragmentation are compounded by impacts from roads and development which include, but are not limited to, habitat degradation from human disturbance and heavy recreational uses, clearing of vegetation along rivers and streams ("stream encroachment"), habitat degradation from invasive plants, runoff of contaminants from roads and residential areas, increase in impervious surfaces, roads and development that act as barriers to wildlife movement, increased predation of wildlife by free-roaming housecats and edge-associated predators, loss of native plants and invertebrates, traffic noise that degrades habitat adjacent to roads, and greater road mortality (particularly of reptiles and amphibians).

In addition, protected natural lands that remain (state, county, non-government organization, private) act as a "magnet resource" attracting residential development that surround and isolates habitat patches. Isolated habitats can become cut off from other habitats, eliminating safe corridors for wildlife to travel between areas. Major impacts of habitat isolation include an overall reduction of wildlife diversity and an increased probability of local extinction of less-mobile wildlife populations. Moreover, in suburban forests and on private lands where hunting is not allowed burgeoning deer populations find refuge. Deer overbrowse destroys seedling trees and prevents forest regeneration; it also destroys habitat for other wildlife such as ground- and shrub-nesting birds. Consequently, these refugia, and some of our remaining public natural lands, are being severely damaged. Coupled with habitat loss and impacts from development, deer over-browse threatens the future of some of New Jersey's forested lands. The difficulty of reducing the impact of deer is exacerbated by a growing reluctance among private landowners to allow hunting on their property, and the close proximity of development to natural lands limits or prohibits the use of firearms.

F. Priority Conservation Zones, Assessments, and Strategies within the Piedmont Plains

1. Northern Piedmont Plains

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

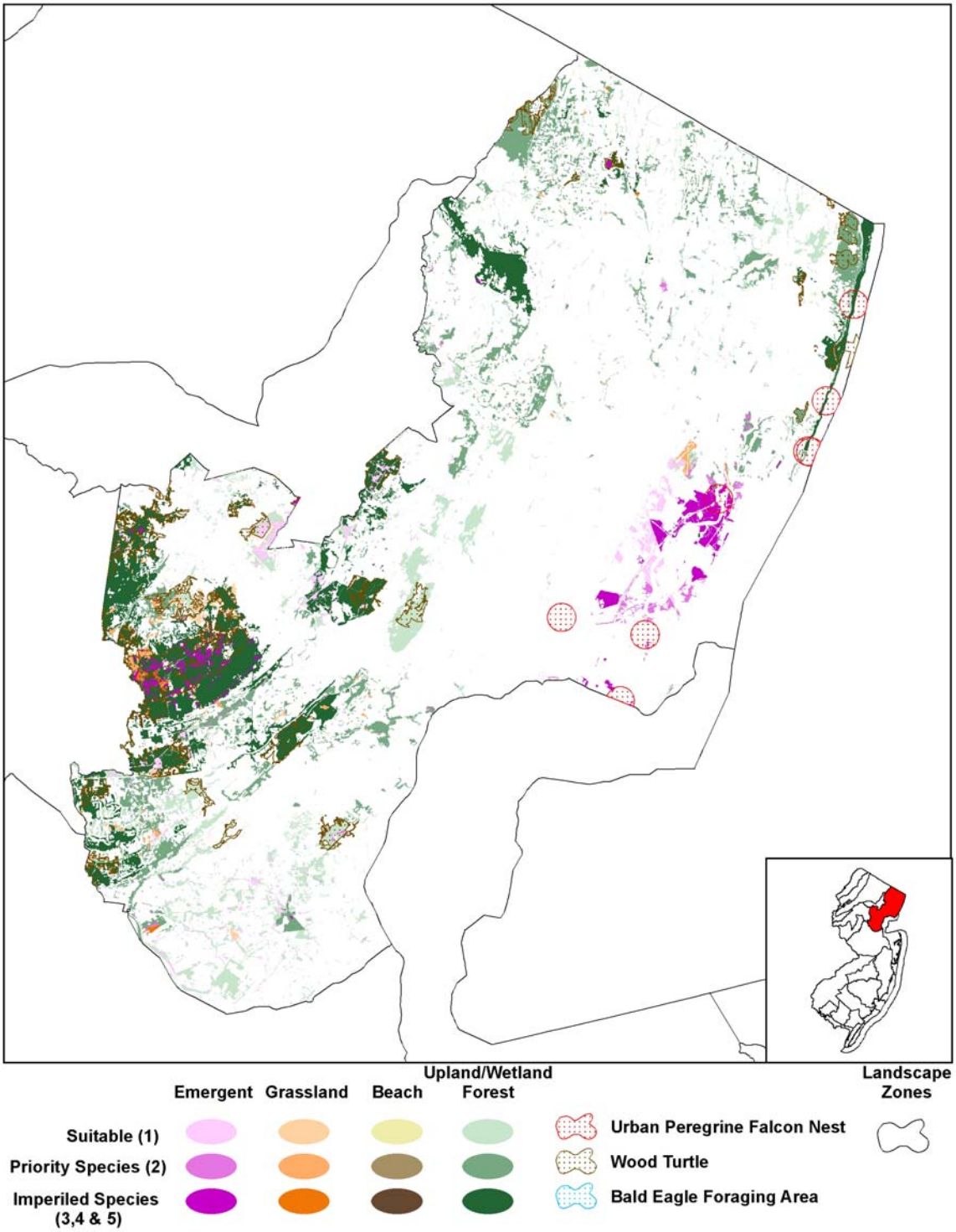
The Northern Piedmont Plains lies within parts of eight counties in northeastern New Jersey (Figure 18). This zone is extensively developed, and about 10 percent of this entire area is considered suitable for wildlife of conservation concern. The Palisades Interstate Park, Great Swamp National Wildlife Refuge, Hackensack Meadowlands, Preakness Mountain, and the network of riparian habitat and public land (mainly county land and watershed protection lands) provide habitat for the majority of endangered and threatened wildlife habitat in this zone.

Over 4,000 hectares or 15.4 square miles of emergent wetlands exist in the Northern Piedmont Plains, most of which occur in the Hackensack Meadowlands, Black Meadows, Great Swamp National Wildlife Refuge (NWR), and Saw Mill Creek Wildlife Management Area (WMA). Approximately 33,500 hectares or 129.3 square miles of forest (upland, wetland, riparian) also exist in the Northern Piedmont Plains. The largest patches (over 404 hectares, 998.3 acres) occur in a scattered network of public natural lands, including High Mountain, Washington Rock, Morristown National Park, and Palisades Interstate Park, with the largest patch (nearly 3,000 hectares, 11.6 square miles) in the Great Swamp NWR.

Early-succession and grassland habitat are scarce in this zone. Less than 1,500 hectares (5.8 square miles) of open fields, such as grasslands, pastures, or agricultural fields, most of which are in Harding Township in Morris County, provide habitat for a few endangered and threatened grassland species. Teterboro Airport, Piscataway Township in Middlesex County and the fields near the Great Swamp NWR contain the largest grassland patches in this zone. Utility rights-of-way provide some of the most critical scrub-shrub habitat for butterflies and species of conservation concern.

Unlike early-successional and grassland habitats, forests take many years to mature, develop a complex vegetative structure, and are difficult to retain in large, unbroken tracts. Therefore, forests (upland, wetland and riparian) are high-priority habitats in this zone. Forest areas should be maintained and allowed to increase in age and size if possible. Grassland and early succession habitats should be maintained where they exist and increased in size if possible. Grasslands in an agricultural matrix, forming a larger complex, can provide habitat for area-sensitive grassland species and a robust grassland wildlife community. However, grasslands and early-succession habitats should not be created at the expense of large or contiguous forests.

Figure 18. Critical landscape habitats within the Northern Piedmont Plains conservation zone, as identified through the Landscape Map (v2).



b. Wildlife of Greatest Conservation Need

The Northern Piedmont Plains supports one federal threatened, 14 state endangered, 12 state threatened, 71 special concern and regional priority species, and seven additional harvested species of regional priority. Species of special concern and regional priority include grassland dependent species, scrub-shrub birds, marsh birds, forest passerines, raptors, reptiles and amphibians, and invertebrates. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, are known to occur in the Northern Piedmont.

Upland and wetland forest at the western extent (especially Great Swamp NWR) and the northeast corner (Palisades Interstate Park) of this zone are important for area-sensitive forest species including the barred owl, red-shouldered hawk, and forest-nesting songbirds, and provide suitable habitat for Indiana and other forest-dwelling bats. The Palisades Interstate Park supports peregrine falcons and the last known remaining population of Allegheny woodrat and the Great Swamp NWR provides habitat for an extraordinary array of bird and amphibian species. These regions are oases surrounded by extensive development and are susceptible to impacts associated with development.

At the eastern extent of this zone, large rivers and associated freshwater wetlands, especially the Meadowlands, provide extensive breeding and foraging habitat for variety of freshwater marsh-nesting birds and long-legged wading birds (waterbirds) including pied-billed grebes, American bitterns, sedge wrens, northern harriers, black- and yellow-crowned night-herons, and insects such as the ringed boghaunter. These large expanses of wetlands and open water are important as migratory stopover and wintering areas for landbirds, waterbirds and waterfowl. Peregrine falcons breed here in good numbers, mainly on bridge structures.

Extensive rivers and streams, and associated habitats (“riparian habitats”) throughout the Northern Piedmont Plains provide habitat for a variety of forest reptiles and amphibians including wood, box and spotted turtles, blue-spotted and northern spring salamanders, and provide foraging and breeding areas for colonial waterbirds (mainly herons and egrets). For these suites of species, American beaver activity can be detrimental because it makes some areas unsuitable by creating permanent standing water bodies.

Although not abundant in this zone, scattered grasslands in the Northern Piedmont Plains provide habitat for savannah, grasshopper, and vesper sparrows; northern bobwhite quail, bobolinks, northern harriers, two insect species, American burying beetles and Harris’ checkerspots; and provide basking and nesting sites for turtles.

Finally, while most of the Northern Piedmont Plains zone is highly developed, urban/suburban habitat supports a number of species for which historical habitats have been significantly altered or reduced. Peregrine falcons, cliff swallows, chimney swifts, and nighthawks breed in highly urbanized areas and utilize man-made structures for nesting habitat. Concentrations of summer bats, including Indiana bats, may utilize buildings and alternative man-made roosts in order to raise their young. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Northern Piedmont Plains

Table PP10. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Reptiles				
Bog turtle		X		X
Insects				
American burying beetle♦		X	X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table PP11. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Allegheny woodrat				X
Bobcat				X
Birds				
American Bittern		X		
Bald Eagle		X		X
Black skimmer		X		
Least tern		R	R	
Loggerhead shrike (migrant)		X		
Northern goshawk			X	
Northern harrier				X
Peregrine falcon		X	X	
Pied-billed grebe		X		
Red-shouldered hawk	X	X		
Sedge wren				X
Amphibians				
Blue-spotted salamander		X		X

R: Proposed reintroduction of species
X: Species occurs within the identified habitat.

Table PP12. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred Owl				X
Black-crowned night-heron		X		
Bobolink			X	
Cooper's hawk				X
Grasshopper Sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Yellow-crowned night-heron		X		
Reptiles				
Wood Turtle				X
Amphibians				
Long-tailed salamander				X
Insects				
Checkered white		R	R	R

R: Proposed reintroduction of species
X: Species occurs within the identified habitat.

Table PP13. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern small-footed myotis				X**
Eastern red bat				X**
Hoary bat				X**
Marsh rice rat			X	
Silver-haired bat				X**
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American golden-plover			X	
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blackburnian warbler				X
Black-throated blue warbler				X
Black-throated green warbler				X
Blue-headed vireo				X
Blue-winged warbler		X		X
Broad-winged hawk				X
Brown thrasher				X
Canada warbler				X
Cerulean warbler				X
Chimney swift				X
Cliff swallow		X		
Common barn owl			X	
Common nighthawk			X	X
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee			X	X
Eastern wood-pewee				X
Field sparrow			X	X
Golden-winged warbler				X
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Great egret		X		
Green heron		X		
Hooded warbler				X
Indigo bunting			X	X
Kentucky warbler				X
King rail		X		
Least bittern		X		
Least flycatcher				X
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Sharp-shinned hawk				X
Spotted sandpiper		X		
Summer tanager				X
Veery				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Willow flycatcher				X
Winter wren				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Reptiles				
Eastern Box Turtle			X	X
Northern copperhead				X
Northern diamondback terrapin		X		
Spotted Turtle		X		X
Amphibians				
Fowler's Toad		X		X
Jefferson salamander				X
Northern spring salamander				X
Insects				
Harris's checkerspot, *Chlosyne harrisii*			X	
Ringed boghaunter, *Williamsonia lintneri*	X			X
Fish				
American brook lamprey*	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy - NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table PP14. Game Species of Regional Priority

Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		X
American woodcock				X
Canada goose (Atlantic population)	X	X		
Clapper rail		X		
Northern bobwhite			X	
Virginia rail		X		
Wood duck				X
Fish				
Brook trout*	X			

*Species is a New Jersey game species, but is also an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table PP15. Fish Species

Common Name	Water
Fish	
Cutlips minnow	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table PP16. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		
Birds				
Ruffed grouse				X
Sora rail	X	X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Northern Piedmont Plains

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The Northern Piedmont Plains is highly developed with scattered tracts of forest and wetlands, most of which are preserved in public natural lands and non-government organization conservation (NGO) lands. Loss and fragmentation of habitats on privately-held lands and isolation of protected natural lands through continued development and roads are the most significant threats to wildlife in this zone. Roads and development destroy and degrade habitat and are barriers to wildlife movements. Fragmentation of habitat allows for many invasive plant species to become integrated into natural areas thereby degrading habitat suitability for many species. Also, fragmentation increases stress on remaining trees, thereby increasing susceptibility of invasive pests (such as Asian longhorned beetles and gypsy moths). White-tailed deer thrive in fragmented non-urban areas and the resulting over-browse of the forest system in this landscape is severe and virtually eliminates forest regeneration. White-tailed deer also selectively browse vegetation, giving invasive species that they avoid eating (barberry species, etc) a stronghold in our forested understory.

The sinuous network of riparian corridors in the center of this zone provides the only safe egress for wildlife to disperse through developed regions. Stream encroachment is the leading cause of degradation of riparian ecosystems including habitat loss, increased water temperatures and runoff of contaminants. Invasive plants, such as common reed or Phragmites (*Phragmites australis*), and purple loosetrife (*Lythrum salicaria*) severely reduce suitability of wetlands for marsh-nesting birds. Breeding populations of non-native trout (brown and rainbow) resulting from stocking for recreational use compete with native populations of brook trout. Mute swans reduce abundance of submerged aquatic vegetation in many reservoirs and freshwater wetlands in the region. Furthermore mallards, which thrive in areas with human habitation, compete with and displace American black ducks and have also been known to hybridize with them. In the Northern Piedmont Plains, these riparian areas include Saw Mill Creek WMA, Hackensack Meadowlands, northern D&R Canal State Park, and other areas in eastern Hudson and northern Middlesex counties. North American beavers can create wetland habitat suitable for many species by damming up streams, but may, in turn, alter riparian habitat downstream from the dam.

Many forest and grassland species are area sensitive and their populations decline as habitat size decreases. Mowing/brush-hogging of fields, roadsides and utility rights-of-way during breeding season (mid-April through early July) increases mortality and reduces productivity of many birds, reptiles and amphibians, invertebrates, and small mammals.

Regional threats to priority species in urbanized areas such as chimney swifts, common nighthawks, cliff swallows, and peregrine falcons include changes in modern building construction that prohibit nesting and increase wildlife strikes. Urbanized areas also typically experience increased pesticide use for mosquito control. Additionally, the impact of free-ranging domestic and feral cats on wildlife is well documented and can severely impact and destroy important urban wildlife populations. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Protect, enhance, and restore critical habitats as identified by the Landscape Project, focusing primarily on habitat for forest-interior passerines, raptors, forest-dwelling bats, and other forest-dwelling species and, secondarily, in areas where grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub (areas with >25% woody vegetation <20 feet in height) wildlife communities currently exist.
- Protect, maintain, and/or enhance critical aquatic habitats, freshwater and coastal wetlands, and water quality to preserve populations of rare wildlife such as wood turtles, long-tailed salamanders, rare damselflies and dragonflies, and state or federal listed, special concern and coldwater fish species that rely on high water quality.
- Identify, protect, maintain, enhance, and/or restore important grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height) for grassland, open field, and scrub-shrub butterfly and bird populations.
- Inventory and monitor all endangered, threatened, and special concern wildlife and fish species in this conservation zone; especially those groups with data gaps.
- Prevent and reverse declines of the Allegheny woodrat, peregrine falcon, reptiles and amphibians, birds, butterfly species of conservation concern, and native fish species; and conserve and enhance native, wild trout populations at optimal levels.
- Assess large-scale habitat change.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Prevent illegal collection of rare reptiles and amphibians (including bog and wood turtles).
- Protect and enhance important and unique natural communities.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Promote public education and awareness, wildlife conservation, and participation in habitat restoration efforts on private land.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Piedmont Plains Regional Landscape stakeholders during a meeting held on September 7, 2006 (see *Attachment F*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect critical habitat identified in the Landscape Project	
1°	Increase the effective size and connectivity of permanently protected public lands and surrounding private lands. Use GIS measures, other remote sensing tools, and surveys to identify important corridors and smaller forest patches that connect larger, forest tracts. Target these areas to maintain a system of connected forest tracts within and between conservation zones including surrounding private lands via incentive programs and backyard habitat programs and targeted land acquisition through Green Acres, land trusts, and local land use policy and planning. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1°	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, timber rattlesnakes, bobcats, Indiana bats, cerulean warblers, Canada warblers, winter wrens, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and upland forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature and managed to create future barred owl and red-shouldered hawk habitat. • Canopy of 10-50% should be maintained at known timber rattlesnake dens and basking areas, and a canopy of >50% in foraging areas (these limits are generally naturally-occurring due to rocky and talus substrates). • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical core forests (forest area >90 meters from the forest edge) and maintain species information in the Biotics database. Preserve and protect core forests through: • Regulations, land acquisition, and incentive programs for forest-dependent breeding species: forest-interior passerines and bobcats (≥ 10 hectares or 24.7 acres of core forest), forest raptors (≥ 100 hectares or 247 acres of contiguous forest), timber rattlesnakes (if unknown foraging habitat, a minimum of 1 ½ mile radius surrounding known den locations or 4,521 acres), and Indiana bats (≥ 6.8 hectares or 17 acres of contiguous forest) per the Forest Management Guidelines for Species of Conservation Concern in New Jersey. • Preservation efforts focused on area- and disturbance-sensitive breeding species in core forests located at least 2,500 meters from major highways. • Prevention of activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). • Identification of habitats adjacent to core forests that can be preserved and/or managed to increase the total size of forest habitat. • Collaboration with land managers, forest stewards, and private landowners to develop and implement best management practices *(Protect habitat – Landscape Project; Silviculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, northern goshawk, long-eared owl, barred owl), forest-interior songbirds (cerulean warbler, Louisiana waterthrush, Canada warbler, winter wren), bobcats, and Indiana bats. Take action to minimize habitat loss by protecting, maintaining, enhancing and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core grassland habitats, assess their condition for nesting grassland birds, and maintain information. Identify protection strategies (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for mowing, conversion to warm-season grasses) to maintain large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat. *(Protect habitat – Landscape Project, sprawl)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats, assess their condition for nesting birds (golden-winged warbler and woodcock), and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create interspersed scrub-shrub habitat in a grassland matrix. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
1º	Provide technical assistance and promote use of Landscape Project mapping in state land-use regulation, municipal planning, land acquisition priorities, and development of management strategies for permanently protected lands. *(Protect habitat – Landscape Project)*
1º	Collaborate with Hackensack, Hudson, and other Riverkeepers to carry out wildlife surveys including birds and invertebrates and populate Biotics database with species occurrence data. *(Conserve wildlife – rare wildlife)*
1º	Use GIS measures and other remote sensing tools, surveys, incentive programs, and public education to select and manage woodlots to maintain dead trees, reduce understory, and thin tree stands for open-woodland species and cavity-nesters such as red-headed woodpeckers. *(Silviculture – land management; Protect habitat – Landscape Project)*
1º	Use GIS measures, other remote sensing tools, and surveys to select woodlots to manage for structural forest diversity, especially shrub and subcanopy understory for forest passerines (cerulean warblers, Kentucky warblers, Louisiana waterthrushes, wood thrushes), priority reptiles, amphibians, and invertebrate species. *(Silviculture – land management; Protect habitat – Landscape Project)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify coniferous and hemlock forests with >70% forest cover to protect and maintain them, through land acquisition, incentive programs, and public education, for priority bird species (black-throated green warbler, blue-headed vireo), reptiles and amphibians. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote sensing tools, and surveys to identify coniferous and hemlock forests with >70% forest cover to protect and maintain them, through land acquisition, incentive programs, and public education, for priority bird species (black-throated green warbler, blue-headed vireo), reptiles and amphibians. *(Protect habitat – Landscape Project)*
2º	Collaborate with other agencies and conservation groups that collect data on wildlife populations (New Jersey Meadowlands Commission, Hackensack, Hudson, and other Riverkeepers, etc.) to identify and protect important habitats and populate Biotics database with species occurrence data. *(Protect habitat – Landscape Project)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g., regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*
Protect suitable aquatic/wetland/riparian habitat and water quality for wildlife and fish species of conservation concern	
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect species dependent upon vernal pool habitat. *(Conserve wildlife – rare wildlife)*
1º	Restore and maintain bog turtle habitat by providing incentives to landowners for long-term management of wet meadows utilizing FWS Region 5 BMPs for bog turtles (prescribed grazing, targeted herbicide application, stem cutting and removal, or a combination of these). *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
1º	Wetlands used as breeding sites should be protected from chemical contamination, siltation, eutrophication, and other forms of pollution/contamination that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote sensing tools, and surveys to identify and best management practices to maintain wetlands with dead trees for red-headed woodpecker and other cavity-nesters. *(Protect habitat – development; Silviculture – land management)*
1º	Increase the number of acres of freshwater wetlands managed for pied-billed grebes: create impoundments, maintain stable water levels during nesting season, restrict recreational activity, monitor contaminant levels; hemi-marsh conditions (approximately 50% water and 50% emergent vegetation cover) favored by grebes need to be maintained by periodic reversal of vegetation succession to open up some of the extensive stands of emergent vegetation, but suitable habitat for nesting needs to be maintained in nearby areas during wetland management. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect important coldwater fish habitat and ecosystems through the Fishtrack database and water quality regulations. *(Protect habitat – Landscape Project, fish)*
2º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Work with local agencies and stakeholders to develop a landscape-scale plan for restoration of degraded emergent wetlands adjacent to the Meadowlands for colonial waterbirds, freshwater marsh birds and other wetland-dependent wildlife. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Protect all large (> 4.9 hectares, 12.1 acres) freshwater wetlands from development, draining, pollutants from runoff and other forms of habitat loss and degradation through regulations, land acquisition, fee purchase, conservation easements, and incentive programs. *(Protect habitat – development, humans)*
2º	Increase the total acreage of restored and enhanced forest, emergent, riparian, and coastal wetlands (Hackensack Meadowlands) on permanently protected natural lands and surrounding private lands. *(Enhance habitat – private lands)*
2º	Maintain and enhance riparian areas and associated wetlands for bog turtles, songbirds, raptors, long-legged wading birds, riparian reptiles and amphibians and invertebrates; work to increase buffer sizes for riparian areas and wetlands in permits as appropriate to provide habitat for riparian species and travel corridors for wildlife in developed regions and prevent degradation of riparian habitats. *(Protect habitat – development; Enhance habitat – private lands)*
2º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Work with appropriate federal, state, and local agencies to maintain and enhance floodplain habitats for wildlife and storm water control. *(Protect habitat – development; Enhance habitat – private lands)*
Identify and protect important grassland and scrub-shrub habitats	
1º	Develop and implement best management practices for grasslands (areas with >75 % herbaceous and <25% woody vegetation) to improve habitat quality for grassland species and prevent destruction of nests and young, eggs and larvae by early mowing. Guide private and public landowners to implement best management practices for species dependent on grassland and other early succession communities. *(Agriculture – land management; Enhance habitat – private lands)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify areas where scrub-shrub habitat (areas with >25% woody vegetation <20 feet in height) can be created and/or maintained with little impact to forested, wetland, and grassland habitats to maintain populations of shrub-dependent butterflies, reptiles, amphibians, and birds such as American woodcocks, ruffed grouse, and golden-winged warblers. *(Protect habitat – Landscape Project)*
2º	Maintain and enhance grassland habitats where they exist; do not expand or create grassland habitat at the expense of large forests that meet the needs of area-sensitive forest species. Acquire grassland habitat through direct purchase or easements; enlist private lands in preservation and management programs that offer long-term (no less than 5 years) stability of a matrix of grassland schemes including various stages of vegetative succession, where appropriate. *(Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Collaborate with large landfill operations in New Jersey and New York to promote planting and management of capped landfills for grassland birds and evaluate effectiveness of management through surveys. *(Enhance habitat – private lands)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Through national, standardized survey protocols, utilizing citizen scientists, continue long-term monitoring and survey to collect baseline data (on protected lands) of raptors, songbirds, reptiles, amphibians, colonial waterbirds, and aquatic invertebrate populations, and incorporate new information into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Promote coordination of species monitoring and management efforts among conservation groups and state agencies in New Jersey by using standardized monitoring and data entry methods for birds and reptiles and amphibians. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
1º	Collaborate with conservation organizations to inventory acquired land and update open space GIS layer as data become available. *(Monitor wildlife – long-term monitoring)*
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas, for example in the Hackensack Meadowlands. *(Monitor wildlife – long-term monitoring)*
1º	Survey to collect baseline data for endangered, threatened and special concern wildlife on permanently-protected natural lands. Incorporate all data into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Identify and inventory coastal and inland wetlands important for colonial waterbirds, long-legged waders, marsh-nesting birds, and waterfowl for which we have little data. *(Monitor wildlife – long-term monitoring)*
1º	Research and evaluate effectiveness of water quality management practices on wood and bog turtles, special concern amphibians, and aquatic invertebrates, particularly those practices associated with permitting and mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Determine population status and monitor trends of forest dwelling bat species in comparison to land use changes and alteration of habitat through long-term acoustical sampling and trapping/netting surveys. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for wood turtle and special concern amphibian populations. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Develop protocol to monitor abundance and distribution of colonial waterbirds north of the Coastal Landscape; incorporate these data and other data from the area into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Systematically survey the Northern Piedmont Plains zone, particularly Teterboro Airport, Hackensack Meadowlands, Great Swamp NWR, and areas in Piscataway, South Plainfield, Warren, Harding, Hanover, West Caldwell, and Bergen County for songbirds, raptors, colonial waterbirds, grassland/open-field and wetland butterflies, and waterfowl. *(Monitor wildlife – long-term monitoring)*
2º	Using the Landscape Project, data from Biotics, and surveys, identify key breeding locations for cliff swallows and common nighthawks for immediate conservation efforts. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct surveys to find more information about the species and management requirements of rails. *(Conserve wildlife –rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and inventory areas suitable for American burying beetles, Harris' checkerspots, ringed boghaunters, long-tailed salamanders, saltmarsh sharp-tailed sparrows, seaside sparrows, and purple finches. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Monitor and develop management strategies for coldwater fisheries in large reservoirs. *(Monitor wildlife – fish)*
2º	Systematically monitor fish populations, including native, wild trout, to keep management strategies current, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
Prevent and reverse declines of wildlife populations	
1º	Work with managers to increase the number of impoundments managed to benefit bitterns, rails, ducks and some invertebrates by providing suitable foraging habitat and encouraging dense stands of emergent vegetation for nesting. *(Protect habitat – humans)*
1º	Continue research and systematic monitoring of Allegheny woodrat populations in the Palisades, including control of impact from disease. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Maintain and enhance reptile and amphibian populations by increasing law enforcement (hiring additional officers) and penalties for illegal collection for the pet trade (bog and wood turtles) and working with state, county, and local DOTs to install raised roads or multiple culverts to reduce road mortality (e.g., along known box turtle breeding locations near roads). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*
1º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
1º	Develop an appropriate survey method for tracking populations of chimney swifts and common nighthawks and conduct a thorough status assessment of these species. *(Conserve wildlife – rare wildlife)*
1º	Through systematic surveys, develop baseline data on wildlife species in urban and suburban habitats and incorporate species occurrence data into the Biotics database. Compile better life history information on species that use urban habitats, (e.g., nest predators and levels of nest depredation, breeding longevity and reproductive effort over time, characteristics of preferred nesting requirements, fidelity to breeding and wintering sites, and better assessment of migration routes). *(Monitor wildlife – long-term monitoring)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors – roads)*
1º	Use baseline data to develop management strategies for endangered, threatened and special concern wildlife on permanently protected natural lands. *(Conserve wildlife – rare wildlife)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Conserve wildlife – rare wildlife)*
2º	DFW will collaborate with USDA to identify and prioritize, based upon species of greatest conservation need, areas where rapid response to an exotic pathogen introduction or incident is needed. *(Conserve wildlife – rare wildlife, invasives)*
2º	Identify groundwater recharge areas for blue-spotted salamander breeding sites and incorporate the sites into the Biotics database. *(Conserve wildlife – rare wildlife)*
2º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect aquatic wildlife – humans)*
2º	Develop management strategies to assure the protection of the state's valuable wild coldwater fisheries. *(Protect aquatic wildlife – humans)*
2º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads; Protect habitat – roads, fish)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Continue or develop, implement and evaluate methods for both aquatic and terrestrial invasive species removal programs in critical wildlife habitats. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife - deer, rare wildlife)*
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*

Priority	Conservation Actions (continued)
1º	Support projects, through funding and collaboration of effort, to eliminate aggressive invasive species found on private and public natural lands, especially in large forest and grassland tracts, wet meadow, marsh, emergent wetland, and aquatic habitats. Assess effectiveness of management techniques of invasive species removal on private and public lands. Assess impacts of aquatic invasives on freshwater mussels and implement management strategies to eliminate aquatic invasive species in sensitive or important habitats containing listed freshwater mussels. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
2º	Work with land management agencies to monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the Asian longhorned beetle and gypsy moth. Collaborate on appropriate control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Request permission from private landowners to establish vegetation monitoring plots, especially those interested in or currently enrolled in incentive programs. This will allow greater surveillance of deer impacts on private lands, provide landowners direct information about the health of their land, and provide greater data input into the deer harvest formula. *(Evaluate restoration – deer)*
Prevent illegal collection of rare reptiles and amphibians	
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents and NWR officers, National Park Service law enforcement, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles) and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*
2º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles, corn and pine snakes), persecution (timber rattlesnake), and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*
Protect and enhance important and unique habitats	
1º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats, including but not limited to the Great Swamp NWR, Hackensack Meadowlands and other "oases" in urban and suburban areas. *(Protect habitat – migratory birds; Corridors – migratory birds)*

Priority	Conservation Actions (continued)
1º	Continue to support (through cooperative research and funding) the protection of critical habitat including, but not limited to, the large wetland complex of the Great Swamp National Wildlife Refuge, the Palisades Interstate Park and the globally rare species that occur there, the freshwater tributaries of the Delaware River. *(Protect habitat – development; Conserve wildlife – rare wildlife)*
2º	Federal, state, and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in the Northern Piedmont Plains. *(Protect habitat – Landscape Project)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Develop and implement a habitat improvement and restoration program for coldwater fish. *(Restore aquatic habitat - development)*
1º	Monitor changes in water quality and assess the impacts to the native trout populations on specific waterways where native, wild, summer trout habitat may be in jeopardy due to declining water quality. *(Monitor wildlife – fish)*
2º	Continue to classify waters according to their suitability for native, wild trout, and provide recommendations for surface water classification changes to the Department of Environmental Protection. *(Protect habitat – fish)*
Conserve and enhance wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Protect and enhance bald eagle habitat	
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Wildlife Refuges and Palisades Interstate Park Commission to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*

Priority	Conservation Actions (continued)
Promote public education and awareness and wildlife conservation	
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies. *(Education – humans; Conserve wildlife – cats, subsidized predators)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Collaborate with partners to develop innovative outreach educational programs to protect important habitats. Promote incentive programs to increase enrollment and encourage agricultural landowners to actively manage for grassland dependent species. *(Education – humans; Agriculture – land management)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants and fish to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Maintain and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of ospreys, peregrine falcons, woodland raptors, and grassland birds.
    - Utilize state, federal and local wildlife incentive programs that encourage the management of bog turtle, forest and grassland bird populations.
    - Through incentive programs, target private landowners surrounding public natural lands to manage land for mature forest in order to increase effective size and connectivity of forest patches.
    - Encourage farmers to preserve farmland through conservation easements or Transfer of Development Rights (TDRs) through partnerships with SADC, NJ DEP's Green Acres Program, The Nature Conservancy – NJ Chapter, local land trusts, and local municipalities for the conservation of bog turtle, forest and grassland bird populations.
    - Develop/maintain cooperative relationships with Teterboro Airport to encourage the management of grasslands for species of conservation concern.
    - Collaborate with municipal landfill operations to encourage grassland management on capped landfills.
    - Encourage landowners to allow afforestation of riparian zones utilizing landowner incentive programs.
    - Encourage landowners to manage nesting locations for chimney swifts and common nighthawks
    - Continue to coordinate maintenance and restoration of bog turtle habitat with private landowners on a volunteer basis.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant populations. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - Work with landowners to maintain/enhance existing habitats where listed and special concern fish species and native trout populations occur.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, Conserve Wildlife Foundation, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter and NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
    - Collaborate with Conserve Wildlife Foundation, NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to

recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species
    - Involve Citizen Scientists in monitoring and assessment of chimney swift and common nighthawk occurrences and nesting areas.
    - Continue volunteer-based summer bat concentration surveys.
- Collaborate with NJ Audubon Society to educate public on the effects of free-roaming domestic cats and feral cats on wildlife species of conservation concern.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds.
- Promote backyard habitat management for reptiles, invertebrates, migratory raptors, and passerines.
- Work with landowners to maintain/enhance existing habitats where listed special concern species occur.
- Work with landowners to maintain/enhance existing trout populations.

Wildlife Professionals

- Consult with entomologists to design and conduct surveys for Harris' checkerspots in grasslands and other appropriate habitat.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Develop a working relationship with the American Museum of Natural History Center for Biodiversity and Conservation in support of the existing Metropolitan Biodiversity Program.
- Partner with New Jersey Meadowlands Commission, Hackensack Riverkeeper, NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect osprey, peregrine falcon, and woodland raptor nesting and foraging sites.
    - Maintain emergent wetlands and open water for American bitterns, pied-billed grebes, sedge wrens, colonial waterbirds, and other marsh birds of concern as well as invertebrates (butterflies, dragonflies and damselflies).
    - Initiate and support eradication efforts of invasive plant and vertebrate species and exotic pathogens.
    - Develop a plan based on the survey results and habitat recommendations of the Hackensack Meadowlands study.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
    - Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants and invertebrates.
- Develop effective and coordinated monitoring and data-sharing methods with conservation groups to fill data gaps and enable new species data to be incorporated into Landscape Project and the Biotics database

- Collaborate with NJ Audubon Society on designating Important Bird Areas and fill gaps in baseline data.
- Consult with conservation organizations to develop educational programs.
- Encourage the use of priority habitat maps to guide land acquisition by conservation organizations through programs such as Green Acres Program, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Continue to develop partnerships with fishing- and conservation-oriented organizations to increase conservation and restoration efforts on streams and lakes that provide trout fishing opportunities.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs, and other farm conservation programs.
- Work with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands.
- Continue to develop partnerships with fishing and conservation oriented organizations to increase conservation and restoration efforts on streams and lakes supporting native trout populations.

<u>Academic Institutions</u>

- Partner with Rutgers and other academic institutions to conduct studies necessary to better understand the impacts of deer on biodiversity, forest health, and ecosystem processes and to develop habitat-specific or landscape-specific deer density targets.

<u>Local Government, Other State and Federal Agencies</u>

- Partner with local, state, and federal government agencies, including municipal and county planning boards, US Department of Agriculture (USDA) including Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) - NJ Field Office, Green Acres Program, State Agricultural Development Committee (SADC) Farmland Preservation, and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to maintain and protect osprey, peregrine falcon, woodland raptor and forest songbird nesting and foraging sites.
    - DFW and the USFWS to develop a plan to protect sensitive bog turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle sites.
    - Determine groundwater recharge areas for bog turtle habitats with the Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality in these areas.
    - DFW, National Park Service, conservation organizations, and DEP's Lands Use Regulation Program (LURP) to work to protect and appropriately classify wetlands for special concern invertebrate, reptile, and amphibian populations on state, federal, and private lands.

- DFW to lead in the development of specific conservation plans develop specific conservation plans for special concern birds, reptiles and amphibians, and invertebrates on state lands.
- DFW to identify areas where scrub-shrub macro-sites can be created and/or maintained for American woodcocks and ruffed grouse without negatively affecting endangered, threatened, or special concern species and their habitats.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and other forest dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
- DFW, conservation organizations, and land stewards to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, and invertebrates with the DEP's Division of Watershed Management. Partner with them to investigate water quality and threats of contaminants/pollution.
- DFW to work with the NJDPF to enhance state forests for wildlife: uneven-age stand management, preserve standing and fallen dead biomass, eliminate forestry practices in wetland forests and manage adjacent upland forest for older-growth.
- DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW and DEP's Division of Parks and Forestry (DPF) to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive, non-indigenous plants on federal and state lands and aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
- DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to continue to interact with other state agencies on operational, regulatory, and land-use issues to ensure adequate consideration is given to coldwater fish resources.
- DFW to continue to participate in the review of Land Use Applications that have the potential to impact wild trout populations and rare aquatic species.
- DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
- DFW to coordinate with the NJ Department of Transportation to reduce road mortality to reptiles and amphibians and large mammals and create wildlife under- and overpasses on new roads and road upgrades.

  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
  - DFW to work with land management agencies at state local and federal level to implement deer management plans that achieve desired deer densities on lands that they oversee.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with DEP's Bureau of Water Monitoring and Standards to recommend classification upgrades in water bodies where listed or special concern species occur.
  - Develop effective and coordinated monitoring and data-sharing methods with Great Swamp National Wildlife Refuge, Palisades Interstate Park, watershed management areas, and NJDFW to fill data gaps and enable new species data to be incorporated into Landscape Project and the Biotics database.
  - DFW to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to continue to interact with other state agencies on operational, regulatory, and land-use issues to ensure adequate consideration is given to coldwater fish resources.
  - DFW to continue to participate in the review of Land Use Applications that have the potential to impact wild trout populations.
  - DFW, USFWS, and US Department of Agriculture to continue monitoring diseases that can potentially affect wild, native populations of special concern fish species.
  - DFW to continue working with fishing clubs and organizations, lake communities, hatcheries nationwide, and individuals permitted to stock fish in NJ's freshwater streams and lakes to ensure healthy stock is used to minimize the spread of disease and parasites to native fish species and to prevent the use or release of exotic species.
- DFW to lead in the development of educational materials for public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and colonial waterbird viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat change over time to assess efficacy of habitat management and restoration efforts.
- Incorporate standardized monitoring protocols, measures of success, and timeline for monitoring activities into mitigation projects and habitat conservation plans.
- Annually monitor abundance, productivity, distribution, and trends of bald eagle, osprey (biannually), peregrine falcon, and bog turtle populations; and colonial waterbird, grassland bird, and raptor communities.

- Monitor bald eagle contaminant levels.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, the Vernal Pool Project, and the volunteer coverboard surveys.
- Conduct long-term monitoring of vegetative plots (exclosures) within state lands to assess vegetative success/ failure over time as deer densities change.
- Evaluate success of management activities on private land funded by state, federal and private landowner incentive programs.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants, vertebrates, and invertebrates.
- Continue to monitor deer densities and deer harvest data.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Continue monitoring diseases as outlined in the DFW's annual Fish Health Management Plan.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

2. Raritan Bay and North Atlantic Coast

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

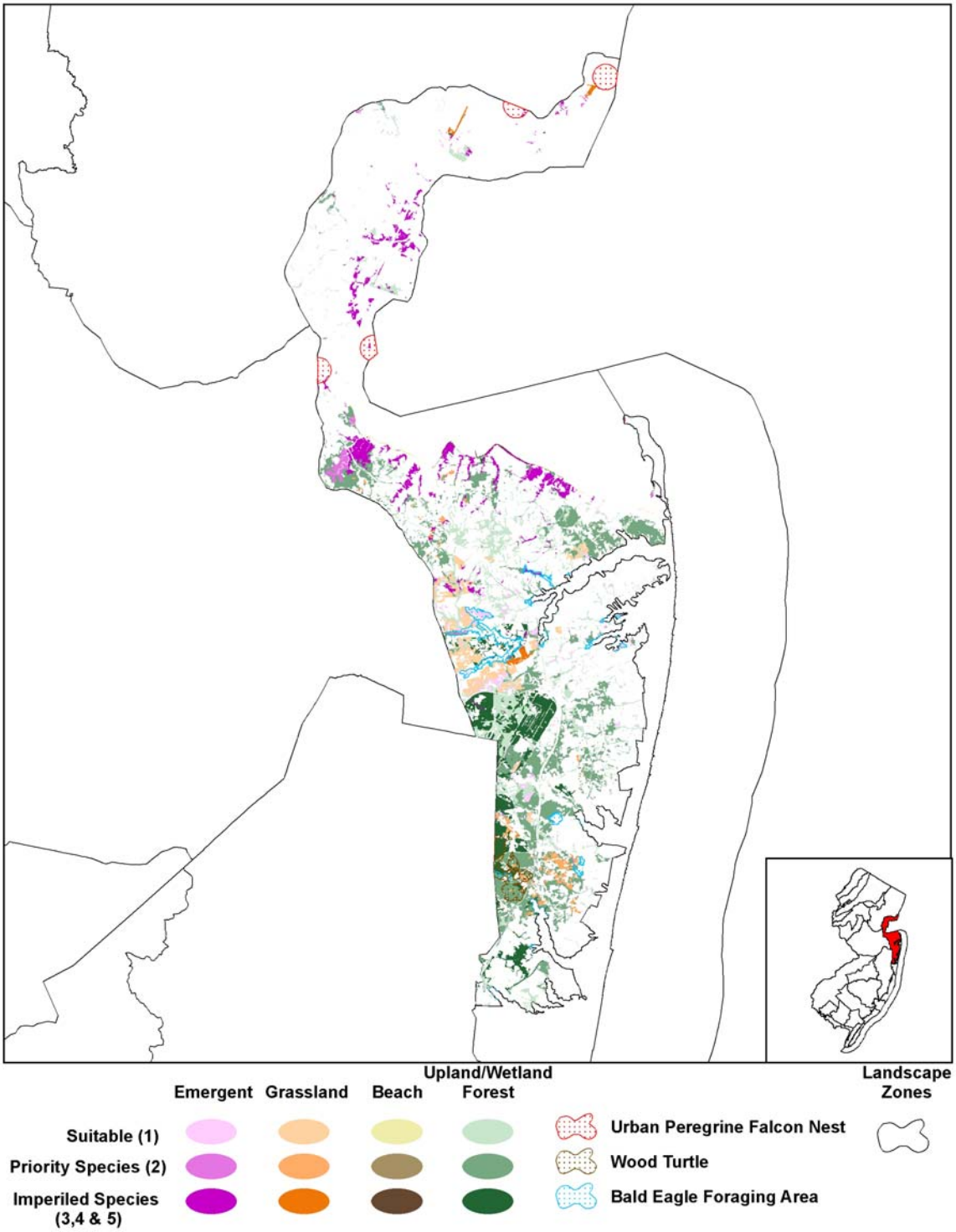
The Raritan Bay zone is located along the coastal areas of Essex, Hudson, Union, Middlesex), and Monmouth Counties (Figure 19). This zone contains parts of Allaire, Cheesequake, and Liberty State Parks, Manasquan River WMA, and Earl Naval Base.

Though largely developed, the Raritan Bay zone is extraordinary because of its extensive network of freshwater streams, ponds, major rivers, and their estuaries (Hudson, Raritan, Manasquan, Shark, Shrewsbury and Navesink) that drain into the Raritan Bay and Atlantic Ocean. Approximately 2,600 hectares or 10 square miles of open wetlands are in the Raritan Bay zone, with the largest wetland patches occurring west of Sandy Hook along the northern coastline of the Raritan Bay and Cheesequake State Park.

Nearly 20,000 hectares (77.2 square miles) of forested habitat (upland and wetland) with patch sizes ranging from less than 0.2 hectares (half an acre) to just under 2,000 hectares (4,942 acres) (Earl Naval Base), dot the landscape of the Raritan Bay. However, less than one fourth of the forest patches here are large enough to support wildlife of conservation concern without the detrimental effects of fragmentation. The southern portion of this zone contains large tracts of upland and wetland forest in Allaire State Park, Earl Naval Base, and various watershed management areas. Approximately 2,800 hectares or 10.8 square miles of open-field habitat (grasslands, pastures, and/or agriculture), with patch sizes ranging from 0.2 hectares (half an acre) to approximately 162 hectares (400 acres), are clustered in the Monmouth County portion of the Raritan Bay. Despite the expanse of open habitat in this area, less than half of the patches meet the minimum size requirement for area-sensitive grassland birds (10 hectares, 24.7 acres), let alone the more than 200 hectares (> 494 acres) needed to support a viable population of breeding upland sandpipers. Allaire, Newark, and Hop Brook Farm airports contain large patches of grasslands. Other areas with significant areas of open-field habitat include Colts Neck, Holmdel, and Wall Township in Monmouth County.

In summary, the priority habitats in this zone from north to south are: 1) estuaries and associated coastal wetlands, 2) riparian areas and associated forest/emergent wetlands, 3) large contiguous upland and wetland forests, 4) grasslands and early-succession habitats, which should be maintained and enhanced where they exist.

Figure 19. Critical landscape habitats within the Raritan Bay and North Atlantic Coast conservation zone, as identified through the Landscape Map (v2).



b. Wildlife of Greatest Conservation Need

The Raritan Bay provides habitat for one federal threatened species, eight state endangered species, eleven state threatened species, 71 special concern and regional priority species, and 17 additional harvested regional priority species.

Large expanses of marsh and riparian areas retain significant open water, emergent, forested, and coastal wetlands that provide extensive foraging habitats throughout the zone for least terns, colonial waterbirds, ospreys, freshwater wetland birds, spotted turtles, and Fowler's toads. Raritan Bay winters one of the largest concentrations of greater and lesser scaup in the Atlantic Flyway. Peregrine falcons breed on bridge structures in the northern reach of this zone and Monmouth County riparian forests and open water support breeding bald eagles and forest songbirds. Large forest tracts border the Pinelands Landscape and support forest-interior raptors (red-shouldered hawks, barred owls, Cooper's hawks) and forest-interior songbirds (black-throated green warblers, scarlet tanagers) These forest tracts are also vital for Pine Barrens treefrogs, wood turtles and other reptiles and amphibians, as migratory stopover for songbirds, and as foraging, roosting and breeding habitat for forest-dwelling bats. Early-succession habitat, is composed of two distinct habitat types, grassland and scrub-shrub, provide habitat for grassland and scrub-shrub birds, including upland sandpipers and savannah sparrows, breeding and nectaring areas for invertebrates (Lepidoptera), and nesting and basking sites for turtles. Cliff swallows, chimney swifts, and concentrations of summer bats can breed in highly urbanized areas and utilize man-made structures for breeding habitat. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Raritan Bay and North Atlantic Coast

Table PP17. Federal Endangered and Threatened Species*

Common Name	Water	Beach and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals					
Indiana bat					X**
Reptiles					
Bog turtle			X	X	X
Insects					
American burying beetle♦			X	X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table PP18. State Endangered Species

Common Name	Water	Beach and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Birds					
Bald eagle			X		X
Black skimmer		X	X		
Henslow's sparrow			R	R	
Least tern		X	X		
Northern harrier			X	X	
Peregrine falcon			X		
Pied-billed grebe	X		X		
Red-shouldered hawk					X
Upland sandpiper				X	

R: Proposed reintroduction of species
X: Species occurs within the identified habitat.

Table PP19. State Threatened Species

Common Name	Water	Beach and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Birds					
Barred owl					X
Black-crowned night-heron		X	X		
Cooper's hawk					X
Grasshopper sparrow				X	
Osprey		X	X		
Savannah sparrow				X	
Yellow-crowned night-heron		X	X		
Reptiles					
Northern pine snake				X	X
Wood turtle			X	X	X
Amphibians					
Pine Barrens treefrog			X		X
Invertebrates					
Checkered white			X	X	X

X: Species occurs within the identified habitat.

Table PP20. Nongame Species of Conservation Concern

Common Name	Water	Beach and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals					
Eastern small-footed myotis					X**
Eastern red bat					X**
Hoary bat					X**
Marsh rice rat				X	
Silver-haired bat					X**
Southern bog lemming					X
Birds					
Acadian flycatcher					X
American kestrel				X	
American oystercatcher		X			
Baltimore oriole					X
Black-and-white warbler					X
Black-billed cuckoo					X
Black-throated green warbler					X
Blue-headed vireo					X
Blue-winged warbler			X		X
Broad-winged hawk					X
Brown thrasher					X
Canada warbler					X
Chimney swift					X
Common barn owl				X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)					
Common nighthawk		X		X	X
Common tern		X			
Eastern kingbird				X	
Eastern meadowlark				X	
Eastern screech-owl					X
Eastern towhee					X
Eastern wood-pewee					X
Field sparrow				X	
Forster's tern		X	X		
Glossy ibis			X		
Gray catbird					X
Great blue heron			X		
Great crested flycatcher					X
Great egret			X		
Green heron			X		
Hooded warbler					X
Horned grebe			X		
Horned lark		X		X	
Indigo bunting				X	X
Kentucky warbler					X
Least bittern			X		
Least flycatcher					X
Little blue heron			X		
Louisiana waterthrush					X
Marsh wren			X		
Northern flicker					X
Northern parula					X
Northern gannet		X			
Pine warbler					X
Prairie warbler					X
Purple finch					X
Red-throated loon		X	X		
Rose-breasted grosbeak					X
Saltmarsh sharp-tailed sparrow			X		
Scarlet tanager					X
Seaside sparrow			X		
Spotted sandpiper			X		
Summer tanager					X
Veery					X
Whip-poor-will					X
Willet		X	X		
Willow Flycatcher					X
Wood thrush					X
Worm-eating warbler					X
Yellow-billed cuckoo					X
Yellow-breasted chat					X
Yellow-throated vireo					X
Yellow-throated warbler					X
Reptiles					
Eastern box turtle				X	X
Northern copperhead					X
Northern diamondback terrapin			X		X
Spotted turtle			X	X	X
Amphibians					
Fowler's toad				X	X
Northern spring salamander				X	X
Insects					
A noctuid moth, *Chytonix sensilis*					X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Beach and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Fish					
American brook lamprey*	X				X

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy - NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table PP21. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Beaches and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Birds					
American black duck	X		X		X
American woodcock					X
Atlantic brant	X				
Black scoter	X				
Bufflehead	X				
Canada goose (Atlantic population)	X		X		
Canvas back	X				
Clapper rail			X		
Greater scaup	X				
Harlequin duck*	X		X		
Lesser scaup	X				
Long-tailed duck	X				
Northern bobwhite				X	
Northern pintail	X				
Virginia rail			X		
White-winged scoter	X				
Wood duck					X

*Species considered regional priority, but New Jersey is not significant in the population's survival.
X: Species occurs within the identified habitat.

Table PP22. Fish Species

Common Name	Water
Fish	
Shield darter	X

X: Species occurs within the identified habitat.

Table PP23. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Beaches and Dunes	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals					
River otter	X		X		
Birds					
Ruffed grouse					X
Sora rail			X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Raritan Bay and North Atlantic Coast

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Although most of the large patches of suitable habitat are owned by municipal, county, state, and federal entities, this zone is fairly well developed. Habitat loss and fragmentation and human disturbance are the greatest threats in this zone.

Major waterways in this zone are situated in the New York metropolitan area and support some of the largest petro-chemical facilities in the U.S. As such, this zone faces spill and contaminants related threats that could be potentially catastrophic. This zone receives heavy recreational use of rivers and coastal waters by boats and personal watercraft, which can interfere with the breeding and foraging of bald eagles and colonial waterbirds. Loss and fragmentation of habitats and isolation of protected natural lands by development and roads are significant threats to wildlife in this zone. Roads and development destroy and degrade habitat and act as barriers to wildlife movements. Fragmentation of habitat allows for many invasive plant species to become integrated into natural areas, thereby degrading habitat suitability for many species. Additionally, fragmentation increases stress on the remaining trees thereby, increasing susceptibility of invasive pests (such as Asian longhorned beetle and gypsy moths). White-tailed deer thrive in fragmented non-urban areas and the resulting over-browse of the forest system in this landscape is severe and virtually eliminates forest regeneration. White-tailed deer also selectively browse giving invasive species that they avoid (barberry species, etc) a stronghold in our forested understory. Although more prevalent in the coastal region, predatory laughing gulls, herring gulls, and great black-backed gulls may impact breeding populations of birds, reptiles, and amphibians in this zone.

Stream encroachment is the leading cause of degradation of riparian ecosystems including habitat loss, increased water temperatures and runoff of contaminants. Invasive plants, such as common reed or Phragmites (*Phragmites australis*) and purple loosetrife (*Lythrum salicaria*), severely reduce suitability of wetlands for marsh-nesting birds. The sinuous network of riparian corridors in southern portion of this zone provides the only egress for wildlife to disperse through developed regions. Mute swans degrade wetlands throughout the area by grazing submerged aquatic vegetation. Furthermore mallards, which thrive in areas with human habitation, compete with and displace American black ducks and have also been known to hybridize with them, particularly in the northern part of this zone. In riparian areas, North American beavers can create wetland habitat suitable for many species by damming up streams, but may, in turn, alter riparian habitat downstream from the dam.

Many forest and grassland species are area sensitive and their populations decline as habitat size decreases. Mowing/brush-hogging of fields, roadsides and utility rights-of-way during breeding season (mid-April through early July) increases mortality and reduces productivity of many species, including birds, reptiles and amphibians, invertebrates, and small mammals. Additionally, the impact of free-ranging domestic and feral cats on wildlife is well documented and can severely impact and destroy important urban wildlife populations. Also see Section I-E “Threats to Wildlife and Habitats” (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, enhance and/or restore suitable aquatic, wetland, and riparian habitat and water quality for bald eagle, ospreys, least terns, pied-billed grebes, northern harriers, night-herons, special concern fish species and other aquatic and wetland species of conservation concern.
- Identify, protect, enhance and/or restore large tracts of suitable forest and forested wetland habitat for area-sensitive forest species of conservation concern, particularly for red-shouldered hawks, barred owls, and forest passerines.
- Identify, protect, enhance and/or restore suitable open-field/grassland (areas with >75 % herbaceous and <25% woody vegetation) habitat for area-sensitive grassland species such as upland sandpipers, savannah sparrows, and grasshopper sparrows, and American burying beetles.
- Inventory, determine distribution, and monitor all endangered, threatened, special concern species in the Raritan Bay and North Atlantic Coast zone.
- Prevent, stabilize, and reverse declines of wildlife populations of reptiles and amphibians, birds, and butterfly and moth species of conservation concern and rare fish species.
- Assess large-scale habitat change (every five to 10 years).
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Protect and enhance important and unique natural communities.
- Prevent illegal collection of rare reptiles and amphibian (including bog and wood turtles).
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Promote public education and awareness, wildlife and indigenous nongame fish conservation, and participation in habitat restoration efforts on private land.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Piedmont Plains Regional Landscape stakeholders during a meeting held on September 7, 2006 (see *Attachment F*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife through implementation of Landscape Project mapping	
1°	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Provide technical assistance and promote use of Landscape Project mapping in state land-use regulation, municipal planning, land acquisition priorities, and development of management strategies for permanently protected lands. *(Protect habitat – Landscape Project)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding the importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Study songbird migration and develop appropriate management strategies for important stopover areas including collaboration with surrounding private landowners. *(Protect habitat – migratory birds)*
Protect suitable aquatic/wetland/riparian habitat and water quality for wildlife and fish species of conservation concern	
1º	Increase the number of acres of coastal and riparian emergent wetlands maintained and enhanced for breeding and foraging osprey, colonial waterbirds and marsh-nesting birds (yellow- and black-crowned night-herons, northern harriers, pied-billed grebes, rails). *(Protect habitat – development; Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and best management practices to maintain wetlands with standing dead trees for red-headed woodpecker and other cavity-nesters. *(Protect habitat – Landscape Project; Silviculture – land management)*
1º	Preserve and protect occupied and potential habitat for black rails and sedge wren by restricting human activity at nesting sites and preserving surrounding wetlands through regulations, land acquisition, and incentive programs. *(Protect habitat – development, humans; Enhance habitat – private lands)*
1º	Protect all large (> 4.9 hectares, 12.1 acres) freshwater wetlands from development, draining, pollutants from runoff and other forms of habitat loss and degradation through regulations, land acquisition, and incentive programs. *(Protect habitat – development, humans)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish)*

Priority	Conservation Actions (continued)
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
1º	Protect marshes from chemical contamination, siltation, eutrophication, and other forms of pollution/contamination that could directly harm wetland dependent species or their food supply. Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
2º	Increase the number of acres of forested riparian areas and larger forest tracts maintained and enhanced for breeding bald eagles, forest raptors, songbirds, reptiles and amphibians, and terrestrial and aquatic invertebrates. *(Protect habitat – development; Conserve wildlife – rare wildlife)*
2º	Increase the number of acres of riparian buffer areas maintained and enhanced through stream bank stabilization, erosion control, native plantings, and fencing for songbirds, raptors, long-legged wading birds, riparian reptiles and amphibians, and invertebrates. *(Protect habitat –development; Conserve wildlife – rare wildlife)*
2º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project *(Protect habitat – Landscape Project)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Work with local agencies and stakeholders to develop and implement proactive habitat management/conservation plans for colonial waterbirds that focus on habitat protection and restoration and population recovery. *(Protect habitat – development; Conserve wildlife – development)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*

Priority	Conservation Actions (continued)
Protect suitable forest and forested wetland habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest raptors (red-shouldered hawk, barred owl), if applicable, and forest-interior songbirds (scarlet tanager, wood thrush, northern parula, pine warbler, veery). Take action to minimize habitat loss by protecting, maintaining, enhancing and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core forests (forest area >90 meters from the forest edge) and maintain information in the Landscape Project and Biotics database. Preserve and protect core forests through regulations, land acquisition, and incentive programs for forest-interior passerines (≥ 10 hectares or 24.7 acres of core forest) and forest raptors (≥ 100 hectares or 247 acres of contiguous forest), if applicable, per the Forest Management Guidelines for Nongame Species in New Jersey. Focus preservation efforts in forests that are at least 2,500 meters from major highways. Work to prevent activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). Identify adjacent habitats to core forests that can be preserved and/or managed to increase the total size of forest habitat. *(Protect habitat – Landscape Project; Silviculture – land management)*
1º	Use GIS measures and other remote sensing tools, surveys, incentive programs, and public education to select and manage woodlots to maintain dead trees, reduce understory, and thin tree stands for open-woodland species and cavity-nesters such as nightjars and red-headed woodpeckers, respectively. *(Silviculture – land management; Conserve wildlife – rare wildlife)*
1º	Increase the effective size and connectivity of forested habitats and habitat corridors through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest; target these areas for enhancement/acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Revegetate and increase size of stream corridors in developed regions to create a network of corridors that allow wildlife passage through the landscape. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, timber rattlesnakes, bobcats, Indiana bats, wood thrush, northern parulas, scarlet tanagers, and pine warblers) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and upland forests for forest-interior passerines (managing for mature deciduous or mixed forests with 65-85% canopy closure and structural diversity; managing pine or mixed-pine forests with sparse understory). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature and managed to create future barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify coniferous and hemlock forests with >70% forest cover to protect and maintain them, through land acquisition, incentive programs, and public education, for priority bird species (black-throated green warbler, northern parula), reptiles and amphibians. *(Protect habitat – Landscape Project)*
Protect suitable grassland habitat for wildlife species of conservation concern	
1º	Use GIS measures, other remote sensing tools, and surveys to identify existing grasslands important for endangered, threatened, and special concern species; increase the number of acres of large grasslands enhanced to support a robust grassland community. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify areas where scrub-shrub habitat can be created and/or maintained for populations of butterflies and moths, reptiles, amphibians, and scrub-shrub birds such as American woodcock and northern bobwhite quail. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Collaborate with municipal landfill operations to promote planting and management of capped landfills for grassland-dependent species and evaluate effectiveness of management through surveys. *(Education – humans)*
2º	Maintain and enhance grassland habitats where they exist; do not expand or create grassland habitat at the expense of large forest that meet the needs of area-sensitive forest species. Acquire grassland habitat through direct purchase or easements; enlist private lands in preservation and management programs that offer long-term (no less than 5 years) stability of a matrix of grassland schemes including various stages of vegetative succession, where appropriate. *(Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Develop, implement and evaluate best management practices (BMPs) through wildlife and habitat surveys on utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas. *(Monitor wildlife – long-term monitoring)*
1º	Through national, standardized survey protocols, using citizen scientists, continue long-term monitoring and survey to collect baseline data (protected lands) of raptors, songbirds, reptiles, amphibians, colonial waterbirds, and aquatic invertebrate populations, and incorporate new information into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Promote coordination of species monitoring and management efforts among conservation groups and state agencies in New Jersey by using standardized monitoring and data entry methods for birds and reptiles and amphibians. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for bald eagle, wood turtle, and special concern amphibian populations. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Research and evaluate effectiveness of water quality management practices on wood and bog turtles, special concern amphibians, and aquatic invertebrates, particularly those practices associated with permitting and mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Determine population status and monitor trends of forest dwelling bat species in comparison to land use changes and alteration of habitat through long-term acoustical sampling and trapping/netting surveys. *(Monitor wildlife – long-term monitoring)*
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
1º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct surveys to find more information about the species and management requirements of rails and other secretive marsh nesting species. *(Conserve wildlife – rare wildlife)*
2º	Systematically survey the Raritan Bay zone, particularly airports, Liberty, Cheesequake, and Allaire state parks, Earl Naval Base, Manasquan River WMA, Colts Neck, Wall, Middletown, and Tinton Falls for American burying beetle, songbirds, raptors, colonial waterbirds, grassland/open-field butterflies and moths, and wetland butterflies and moths. *(Monitor wildlife – long-term monitoring)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify suitable habitat for northern spring salamanders, northern copperheads, and checkered whites and survey these areas to update the species occurrence data in the Biotics database. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Research survey methods and develop a plan for the survey and long-term monitoring of colonial waterbird populations on the Raritan Bay coast and songbird populations throughout the zone. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by FishTrack Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
2º	Survey all salt marshes for breeding seaside and saltmarsh sharp-tailed sparrows. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
Prevent and reverse declines of wildlife and rare fish populations	
1º	Work with managers to increase the number of impoundments managed to benefit bitterns, rails, ducks and some invertebrates by providing suitable foraging habitat and encouraging dense stands of emergent vegetation for nesting. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
1º	Protect all remaining habitat for saltmarsh sharp-tailed sparrows (high marsh with buffer, stable water levels) through legislation, land acquisition, and incentive programs. Use GIS measures, other remote sensing tools, and data from surveys to identify areas for restoration of snowy egret, saltmarsh sharp-tailed sparrow, seaside sparrow, and rail populations. *(Protect habitat – Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational water-users and cooperation with private landowners. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Conduct literature reviews and research to determine habitat needs, limiting factors, and contaminant burdens in wintering greater and lesser scaup and sea ducks of conservation concern. *(Conserve wildlife – game species)*
2º	Continue to monitor reproductive success of peregrine falcons and northern harriers and protect nesting areas from human disturbance through enforcement and volunteer efforts. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Conduct research to assess the potential impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations. Conduct studies and create models to identify migratory routes of and assess the potential impacts of wind turbines, tall buildings, radio towers and other "human-made" tall structures to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat - humans)*
2º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect aquatic wildlife-humans)*
2º	Study how land use practices such as ditching, impounding, dredging, open marsh water management, burning, and marsh restoration impact species in this suite and assess/revise management actions where appropriate. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Monitor wildlife – fish)*
2º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads; Protect habitat – roads, fish)*
2º	DFW will collaborate with USDA to identify and prioritize, based upon species of greatest conservation need, areas where rapid response to an exotic pathogen introduction or incident is needed. . *(Conserve wildlife – invasives, rare wildlife)*

Priority	Conservation Actions (continued)
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	Continue or develop, implement and evaluate methods for both aquatic and terrestrial invasive species removal programs in critical wildlife habitats. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*

Priority	Conservation Actions (continued)
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration – deer)*
2º	Work with land management agencies to monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the Asian longhorned beetle and gypsy moth. Collaborate on appropriate control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Request permission from private landowners (both those who allow hunting and do not allow hunting) interested in or currently enrolled in incentive programs to establish vegetation monitoring plots. This will allow greater surveillance of deer impacts on private lands, provide landowners direct information about the health of their land, and provide greater data input into the deer harvest formula. *(Evaluate restoration – deer)*
Protect and enhance important and unique habitats	
1º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats, including but not limited to areas near the Atlantic Highlands (Holmdel, Middletown Hazlet), Manasquan Naval Depot (Colts Neck, Tinton Falls), and Tom's River (Brick, Wall). *(Protect habitat – migratory birds; Corridors – migratory birds)*
2º	Federal, state, and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in the Raritan Bay and North Atlantic Coast. *(Protect habitat – Landscape Project)*
2º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to protect and enhance habitats, including but not limited to the pine barren upland/wetland complex and rare plant species at Shark River Station, through incentive programs, land acquisition, the creation and use of BMPs, and increased law enforcement efforts to minimize disturbance. *(Protect habitat – development)*

Priority	Conservation Actions (continued)
Prevent illegal collection of reptiles and amphibians	
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, US Army and US Navy Natural Resources Managers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles, northern pine snakes), persecution (northern pine snakes), and human disturbance (off-road-vehicles). *(Protect wildlife – humans, recreational vehicles)*
2º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles, corn and pine snakes), persecution (snakes), and human disturbance (off-road-vehicles). *(Protect wildlife – humans, recreational vehicles)*
Protect and enhance bald eagle habitat	
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Promote public education and awareness and wildlife conservation	
1º	Engage landowners in protection efforts for endangered species by increasing enrollment in programs like the Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Collaborate with partners to develop innovative outreach educational programs to protect important habitats. Promote incentive programs to increase enrollment and encourage agricultural landowners to actively manage for grassland dependent species. *(Education – humans; Agriculture – land management)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	Educate public about the importance of keeping cats indoors through public service announcements, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies. *(Education – humans; Conserve wildlife – cats, subsidized predators)*
1º	Educate public on threats to wildlife by creating brochures and posters and develop management guidelines for private landowners with significant bald eagle, wood turtle, freshwater wetland bird, grassland bird, woodland raptor, or scrub-shrub/open field bird populations. *(Conserve wildlife – rare wildlife; Education – humans)*
1º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is key to the successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of bald eagle, forest passerine, freshwater wetland bird, raptor, and scrub-shrub/grassland bird populations.
    - Collaborate with conservation groups to utilize existing wildlife incentive programs to aid private landowners in habitat restoration.
    - Utilize incentive programs that encourage the management of bog turtle, other priority species and grassland dependent species populations.
    - Target private landowners surrounding public natural lands to manage land for mature forest in order to increase effective size and connectivity of forest patches.

- Encourage farmers to preserve farmland through conservation easements or Transfer of Development Rights (TDRs) through partnerships with NJ DEP's Green Acres Program, The Nature Conservancy – NJ Chapter, SADC, NJ Farm Bureau, local land trusts, and local municipalities for the conservation of bog turtle, forest and grassland bird populations.
- Develop/maintain cooperative relationships with private landowners with bog turtles and breeding bald eagles and freshwater wetland birds on their land.
- Develop/maintain cooperative relationships with Newark, Allaire, and Hop Brook Farm airports to encourage the management of grasslands for species of conservation concern.
- Encourage landowners to allow afforestation of riparian zones through incentive programs
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
- Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
- Work with landowners to maintain/enhance existing habitats where listed and special concern fish species occur.

<u>Public</u>

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter, Conserve Wildlife Foundation, and NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species.
    - Involve Citizen Scientists in management projects and protection projects, such as protection and posting of bald eagle nesting areas.
    - Continue volunteer-based summer bat concentration surveys.
- Collaborate with NJ Audubon Society, NY/NJ Baykeeper, Raritan Riverkeeper, State Parks, and other conservation organizations to educate public on the impacts of free-ranging domestic cats and feral cats and other threats on wildlife species of conservation concern.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds.
- Promote backyard habitat management for invertebrates, reptiles, amphibians, migratory raptors and passerines.
- Work with landowners to maintain/enhance existing habitats where listed special concern species occur.

Conservation Organizations

- Partner with NY/NJ Baykeeper, Raritan Riverkeeper, NJ Conservation Foundation, NJ Audubon Society, The Nature Conservancy – NJ Chapter, and other conservation organizations to protect and enhance habitats.
    - Develop a long-term coordinated monitoring and data-sharing project for colonial waterbirds and songbirds.
    - Protect bald eagles, ospreys, peregrine falcons, and woodland raptor nesting and foraging sites.
    - Protect emergent wetlands and open water for American bitterns, pied-billed grebes, sedge wrens, colonial waterbirds, and other marsh birds of concern
    - Initiate and support eradication efforts for invasive plant species
    - Create wildlife viewing opportunities.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
    - Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.
- Develop effective and coordinated monitoring and data-sharing methods with conservation groups to fill data gaps and enable new species data to be incorporated into Landscape Project and the Biotics database.
- Collaborate with NJ Audubon Society on designating Important Bird Areas and fill gaps in baseline data.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds.
- Encourage the use of priority habitat maps to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC), Farm Bureau for Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.

Wildlife Professionals

- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USDA's Natural Resource Conservation Service (NRCS), USFWS - NJ Field Office, and the DCA, Office of Smart Growth to protect, enhance, and create habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to work with the DEP's Land Use Regulation Program to protect and appropriately classify wetlands for spotted turtles.
    - DFW, conservation organizations, and land stewards to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, and invertebrates with Division of Watershed Management and Division of Fish and

Wildlife. Partner with them to investigate water quality and threats of contaminants/pollution.

- DFW to work with the DEP's Division of Parks and Forestry (NJDPF) to enhance state forests for wildlife: uneven-age stand management, preserve standing and fallen dead biomass, manage for older-growth forests especially wetland forests and adjacent upland forest.
- DFW to share site information and expertise with state and federal law enforcement to increase surveillance at sensitive bald eagle and bog turtle sites.
- Work with DEP's Water Monitoring and Standards to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
- DFW to work with state and county mosquito commissions to reduce the use of deleterious insecticides and biological controls at known amphibian breeding sites.
- DFW to coordinate with the Department of Transportation to reduce road mortality to reptiles and amphibians and large mammals by creating wildlife under- and overpasses on new roads and road upgrades.
- DFW to lead in the development of specific conservation plans for special concern birds, reptiles and amphibians, and invertebrates on state lands.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and other forest dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
- DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with land stewards, private landowners, and municipal, state and federal staff to establish best management practices in areas where listed or special concern species occur.
- DFW to identify areas where scrub-shrub macro-sites can be created and/or maintained for American woodcocks and northern bobwhite quail without negatively affecting endangered, threatened, or special concern species and their habitats.
- DFW and DEP's Division of Parks and Forestry (DPF) to work with the USFWS and National Park Service to develop effective plans to eradicate invasive, non-indigenous plants on federal and state lands and aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.

  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
  - DFW to work with DEP's Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - Develop effective and coordinated monitoring and data-sharing methods with Allaire, Cheesequake, and Liberty state parks, Earl Naval Base, DFW, and watershed management areas to fill data gaps and enable new species data to be incorporated into Landscape Project and the Biotics database.
  - DFW to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, USFWS, and US Department of Agriculture to continue monitoring diseases that can potentially affect wild, native populations of special concern fish species.
  - DFW to continue working with fishing clubs and organizations, lake communities, hatcheries nationwide, and individuals permitted to stock fish in NJ's freshwater streams and lakes to ensure healthy stock is used to minimize the spread of disease and parasites to native fish species and to prevent the use or release of exotic species.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and colonial waterbird viewing opportunities.
- DFW to lead in the development of educational materials for public and private landowners about wildlife of greatest conservation need and associated habitats.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Incorporate standardized monitoring protocols, measures of success, and timeline for monitoring activities into mitigation projects and habitat conservation plans.
- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts on private and public land.
- Annually monitor abundance, productivity, distribution, and trends of ospreys (biannually), bald eagles and colonial waterbirds.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, the Vernal Pool Project, and the volunteer coverboard surveys.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Conduct long-term monitoring of vegetative plots (exclosures) within state lands to assess vegetative success/ failure of deer management strategies over time as deer densities change.

- Continue monitoring diseases as outlined in the DFW's annual Fish Health Management Plan.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

3. Central Piedmont Plains

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

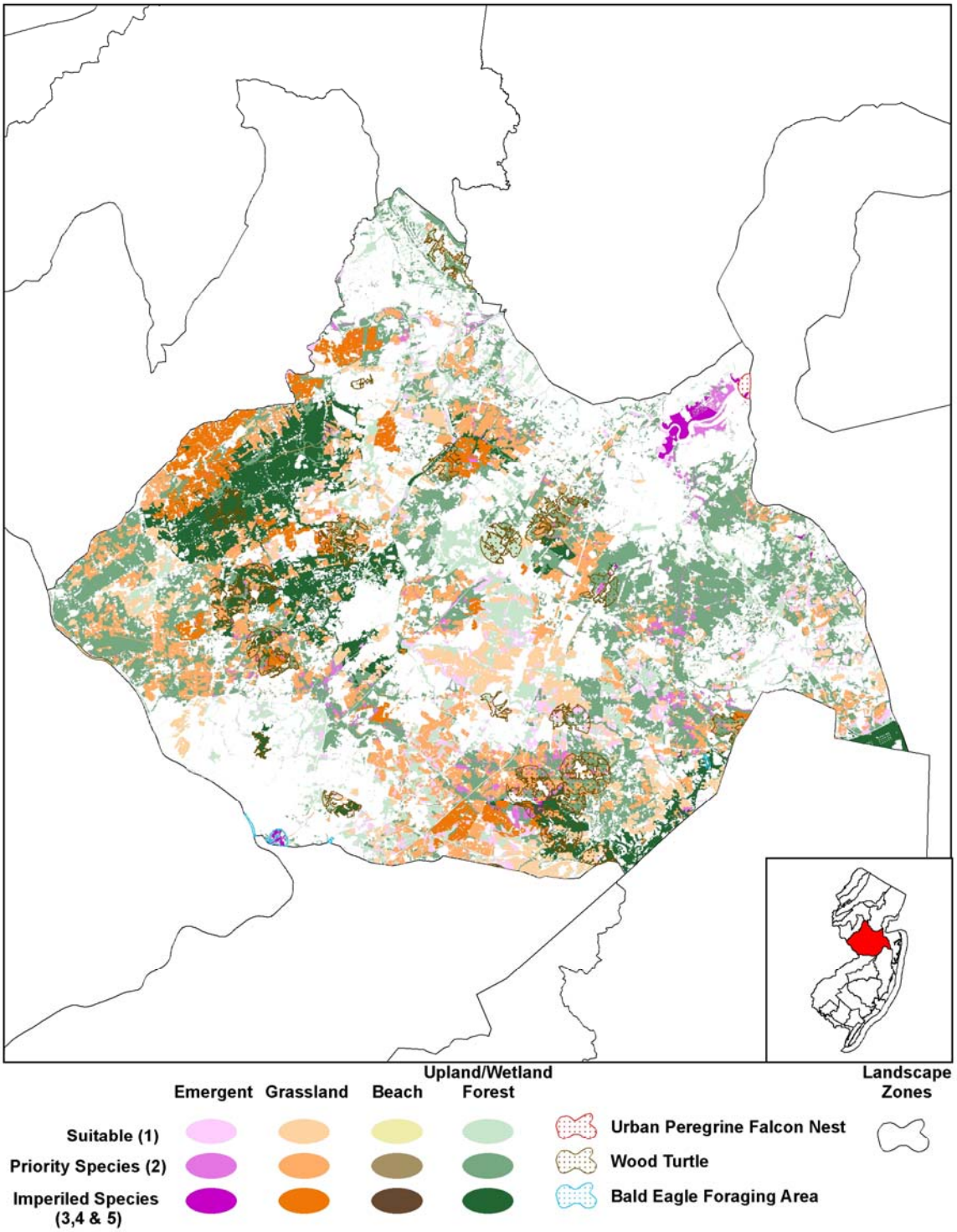
The second largest zone in the state, the Central Piedmont Plains zone (Figure 20) lies at the "waistline" of New Jersey, consisting of Mercer County, southern portions of Somerset and Middlesex counties and western Monmouth County (west of Highway 34). This region includes the Assunpink Wildlife Management Area (WMA), Delaware & Raritan Canal and Six Mile Run, Sourland Mountain Preserve, and Pigeon Swamp State Park and Forest.

Extensive farmed areas and grasslands, fragmented woodlands, tidal freshwater marshes, and housing developments characterize the Central Piedmont Plain, and about half of the entire area is considered suitable for wildlife of concern. Large agricultural/grassland complexes span this zone along the Mercer-Middlesex border south to Assunpink WMA and include cropland, pasture, and agricultural wetlands. The Sourland Mountain Preserve, Assunpink WMA, and Pigeon Swamp State Park and Forest contain sizeable deciduous forest tracts. The largest wetlands in this zone occur east of the Delaware & Raritan Canal State Park.

This zone is unique because it is a transition area between the hardwood forests of northern New Jersey and the deciduous-coniferous forests of the Pinelands. Preserving connectivity of terrestrial and riparian habitats is a primary goal here.

Forest patches (upland, wetland and riparian) totaling approximately 67,500 hectares (260.6 square miles) in the Central Piedmont Plains, range in size from 0.2 hectare (half an acre) to over 7,000 hectares (27 square miles) (Sourland Mountain Preserve), and are a high-priority habitat type in this landscape. Over 36,000 hectares (138.9 square miles) of early-succession habitat (grasslands, old fields, agriculture), with patch sizes ranging from half an acre to nearly 2,000 hectares (7.7 square miles) (East Amwell Township), provide habitat for all of New Jersey's endangered and threatened grassland birds. Most of these areas are agricultural lands, but there are also 11 airports that provide grassland habitat for species of conservation concern. Approximately 8,500 hectares (32.8 square miles) of emergent wetlands exist in the Central Piedmont Plains. Most of these areas are small pockets of scattered wetlands, but larger expanses exist along the Raritan River estuary and in Assunpink WMA.

Figure 20. Critical landscape habitats within the Central Piedmont Plains conservation zone, as identified through the Landscape Map (v2).



b. Wildlife of Greatest Conservation Need

The Central Piedmont Plains supports one federal endangered and one federal threatened species, ten state endangered species, 17 state threatened species, 69 special concern and regional priority species, and seven additional harvested species of regional priority. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, are known to occur in the Central Piedmont Plains.

The largest forests in the north (Sourland Mountain, forests in the Stony Brook-Millstone Watershed Management Area) support area-sensitive species including the barred owl, bobcat, Cooper's hawk, and a large variety of forest-interior songbirds and forest reptiles and amphibians (wood turtle, northern copperhead, and vernal pool species). Forests in the south also support the barred owl and pinelands species (Pine Barrens treefrog, timber rattlesnake). Forests in both the north and south provide suitable habitat for summer populations of Indiana and other forest-dwelling bat species. Riparian forests (upland and wetland) spanning the zone support a sizeable population of wood turtles and a variety of special concern reptiles and amphibians. The Delaware & Raritan Canal State Park is an important greenway providing breeding and stopover habitat for migratory songbirds.

The large complexes of grasslands within the agricultural matrix in this zone present great management opportunities and currently support area-sensitive grassland species (upland sandpiper, vesper, savannah and grasshopper sparrows, bobolink). Grassland-dependent invertebrates such as pink streak and scarlet bluet are also found in this zone. Many of these areas also provide breeding habitat for scrub-shrub birds, bog turtles, frosted elfin, and basking and nesting areas for wood turtles and eastern box turtles. American kestrels appear to have declined dramatically in this and other agricultural regions of the state, and large complexes of agricultural land provide opportunities to restore populations through a nest-box program.

The diverse wetland, lacustrine (lake), and riverine habitats support colonial waterbirds (greenand great blue herons, and black-crowned night-heron), other freshwater wetland birds (pied-billed grebes, common loons), bog turtles, spotted turtles, carpenter frogs, Fowler's toads, Pine Barrens treefrogs, freshwater mussels, and silver-bordered fritillaries. Cliff swallows, chimney swifts, and concentrations of summer bats, including Indiana bats, can breed in highly urbanized areas and utilize man-made structures for nesting habitat. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Central Piedmont Plains

Table PP24. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Reptiles				
Bog turtle		X		X
Mussels				
Dwarf wedgemussel	X***			
Fish				
Shortnose sturgeon	X			

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
***Riverine habitat.
X: Species occurs within the identified habitat.

Table PP25. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat		X		X
Birds				
American bittern		X		X
Bald eagle		X		X
Northern harrier		X	X	
Peregrine falcon				X
Pied-billed grebe		X		
Red-shouldered hawk				X
Upland sandpiper			X	
Vesper sparrow			X	
Reptiles				
Timber rattlesnake				X
Amphibians				
Blue-spotted salamander		R		R

R: Proposed reintroduction of species
X: Species occurs within the identified habitat.

Table PP26. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred Owl				X
Black-crowned night-heron		X		
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Wood turtle				X
Amphibians				
Eastern mud salamander				X
Long-tailed salamander		X		X
Pine Barrens treefrog		X		X
Mussels				
Tidewater mucket	X			
Triangle Floater	X			
Yellow lampmussel	X			

State Threatened Species (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Insects				
Frosted elfin		X	X	X
Silver-bordered fritillary		X	X	X

X: Species occurs within the identified habitat.

Table PP27. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern small-footed myotis				X**
Eastern red bat				X**
Hoary bat				X**
Marsh rice rat			X	
Silver-haired bat				X**
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American golden-plover			X	
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Black-throated blue warbler				X
Black-throated green warbler				X
Blue-winged warbler		X		X
Broad-winged hawk				X
Brown thrasher				X
Canada warbler				X
Cerulean warbler				X
Chimney swift				X
Chuck-will's-widow				X
Cliff swallow		X	X	
Common nighthawk			X	X
Dickcissel			X	
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		X
Hooded warbler				X
Horned lark			X	
Indigo bunting			X	X
Kentucky warbler				X
Least bittern		X		
Least flycatcher				X
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Rose-breasted grosbeak				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Sharp-shinned hawk				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Spotted sandpiper		X		
Summer tanager				X
Veery				X
Whip-poor-will				X
Willet		X		
Willow flycatcher				X
Winter wren				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle			X	X
Northern copperhead				X
Northern diamondback terrapin		X		
Spotted turtle		X		X
Amphibians				
Carpenter frog		X		X
Fowler's toad		X		X
Mussels				
Creeper	X			X
Insects				
Clubtail dragonfly, *Gomphus septima*	X			X
Scarlet bluet, *Enallagma pictum*	X	X	X	
Pink streak, *Faronta rubripennis*				X
Fish				
American brook lamprey*	X			
Atlantic sturgeon	X			
Bridle shiner	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy - NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table PP28. Game Species of Regional Priority

Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		X
American woodcock				X
Canada goose (Atlantic population)	X	X		
Northern bobwhite			X	
Surf scoter	X			
Virginia rail		X		
Wood duck				X

X: Species occurs within the identified habitat.

Table PP29. Fish Species

Common Name	Water
Fish	
Hickory shad	X
Margined madtom	X
Shield darter	X

X: Species occurs within the identified habitat.

Table PP30. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		
Birds				
Ruffed grouse				X
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to Wildlife and Habitats of the Central Piedmont Plains

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

While some forest, grassland, and wetland habitats are preserved in county, municipal, state, and federal lands, a large portion of these habitats are in danger of being lost to development pressures. Expanding development adjoins wetland habitat, removing upland buffers, and converts forests and farmlands into large homes with neatly trimmed lawns. Fragmentation of forest tracts, wetlands, and grasslands are also significant threats to wildlife. Many raptors and forest and grassland songbirds are area-sensitive and require areas of minimum size to establish territories and reproduce successfully. Fragmentation of habitat allows for many invasive plant species to become integrated into natural areas thereby degrading habitat suitability for many species. Additionally, fragmentation increases stress on the remaining trees, thereby increasing susceptibility of invasive pests (such as Asian longhorned beetle and gypsy moths). White-tailed deer thrive in fragmented non-urban areas and the resulting over-browse of the forest system in this landscape is severe and virtually eliminates forest regeneration. White-tailed deer also selectively browse giving invasive species that they avoid (barberry species, etc.) a stronghold in the forested understory.

Upland and wetland forest are high priority habitats in New Jersey because they are difficult to retain as mature, unbroken tracts and take many years to develop complex "old growth" structure. Most of the open fields in this zone are in the form of agriculture. Mechanized, row-crop agriculture renders agricultural lands unsuitable for most wildlife; mowing of cool-season grasses and along roadsides and utility rights-of-way during breeding season (mid-April through early July) increases mortality and reduces productivity of many species, including reptiles and amphibians, and small mammals, but especially birds and invertebrates.

Invasive plants, such as common reed or Phragmites (*Phragmites australis*) and purple loosetrife (*Lythrum salicaria*), can severely reduce habitat suitability of freshwater wetlands for marsh-nesting birds. Furthermore mallards, which thrive in areas with human habitation, compete with and displace American black ducks and have also been known to hybridize with them. American black ducks are not very prevalent within this zone, but do occur near Van Nest WMA and the Raritan River. In riparian areas, North American beavers can create wetland habitat suitable for many species by damming up streams, but may, in turn, alter riparian habitat downstream from the dam.

Other threats to species in the Central Piedmont Plains include pesticides, herbicides, and traffic noise. Additionally, the impact of free-ranging domestic and feral cats on wildlife is well documented and can severely impact and destroy important wildlife populations. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, enhance, and/or restore suitable forest and wetland forest habitat for wildlife species of conservation concern, particularly for the barred owl, red-shouldered hawk, bobcat, timber rattlesnake, long-eared owl, forest passerines, and frosted elfin.
- Identify, protect, enhance, and/or restore suitable grasslands (areas with >75 % herbaceous and <25% woody vegetation) with interspersed scrub-shrub (areas with >25% woody vegetation <20 feet in height) for wildlife species of conservation concern, particularly for the upland sandpiper, vesper sparrow, grasshopper sparrow, bobolink, savannah sparrow, pink streak and scarlet bluet.
- Identify, protect, enhance, and/or restore suitable aquatic, wetland and riparian habitat and water quality for wildlife and fish species of conservation concern, particularly for the osprey, northern harrier, American bittern, pied-billed grebe, silver-bordered fritillary, and clubtail dragonfly.
- Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species in the Central Piedmont Plains.
- Prevent, stabilize, and reverse declines of forest raptors and songbirds, freshwater wetland birds, grassland and scrub-shrub birds, open field birds as well as priority reptiles, amphibians, mussels, butterflies, dragonflies, damselflies, and rare fish species.
- Assess large-scale habitat change every five years.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Protect and enhance important and unique natural communities.
- Prevent illegal collection of rare reptiles and amphibian (including bog and wood turtles, timber rattlesnake and pine snake).
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Promote public education and awareness, wildlife and indigenous nongame fish conservation, and participation in habitat restoration efforts on private land.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Piedmont Plains Regional Landscape stakeholders during a meeting held on September 7, 2006 (see *Attachment F*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife through implementation of Landscape Project mapping	
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
1º	Provide technical assistance and promote use of Landscape Project mapping in state land-use regulation, municipal planning, land acquisition priorities, and the development of management strategies for permanently protected lands. *(Protect habitat – Landscape Project)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use baseline data to develop management strategies for endangered, threatened and special concern wildlife on permanently protected natural lands. *(Conserve wildlife – rare wildlife)*
2º	Increase the number of acres of critical wildlife habitat by enhancing and restoring critical habitats through afforestation and revegetation where possible (forest and riparian habitats) and through active management (grasslands, wetlands, and scrub-shrub habitats). *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Study songbird migration and develop appropriate management strategies for important stopover areas including collaboration with surrounding private landowners. *(Protect habitat – migratory birds; Corridors – migratory birds)*

Priority	Conservation Actions (continued)
Protect suitable forest and wetland forest habitat for wildlife	
1º	Increase the effective size and connectivity of permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, timber rattlesnakes, bobcats, Indiana bats, cerulean warblers, Canada warblers, Kentucky warblers, wood thrush, northern parulas, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and upland forests for forest-interior passerines (managing for mature bottomland forests with structural diversity and dense ground cover; mid-successional forests with dense understory; mature coniferous forests with >75% canopy closure). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature and managed to create future barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core forests (forest area >90 meters from the forest edge) and maintain information in the Biotics database. Preserve and protect core forests through regulations, land acquisition, and incentive programs for forest-interior passerines and bobcats (≥ 10 hectares or 24.7 acres of core forest), forest raptors (≥ 100 hectares or 247 acres of contiguous forest), Indiana bats (≥ 6.8 hectares or 17 acres of contiguous forest) per the Forest Management Guidelines for Nongame Species in New Jersey, and timber rattlesnakes (if unknown foraging habitat, a minimum of 1 ½ mile radius surrounding known den locations or 4,521 acres). Focus preservation efforts in forests that are at least 2,500 meters from major highways. Work to prevent activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). Identify adjacent habitats to core forests that can be preserved and/or managed to increase the total size of forest habitat. *(Protect habitat – Landscape Project; Silviculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest raptors (red-shouldered hawk, barred owl, long-eared owl), forest-interior songbirds (Canada warbler, Kentucky warbler, scarlet tanager, wood thrush, northern parula), bobcats, and Indiana bats. Take action to minimize habitat loss by protecting, maintaining, enhancing and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Use GIS measures, other remote sensing tools, and surveys to select woodlots to maintain and manage for structural forest diversity, especially shrub and subcanopy understory for forest passerines (Kentucky warblers, Louisiana waterthrushes, wood thrushes), priority reptiles, amphibians, and invertebrate species. *(Silviculture – land management)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify, protect, and maintain coniferous and hemlock forests with >70% forest cover to protect and maintain them, through land acquisition, incentive programs, and public education, for priority bird species (black-throated green warbler, blue-headed vireo, northern parula), reptiles and amphibians. *(Protect habitat – Landscape Project)*
2º	Increase the number of acres of floodplain forests maintained and enhanced for forest passerines. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
2º	Use GIS measures and other remote sensing tools, surveys, incentive programs, and public education to select and manage woodlots to maintain dead trees, reduce understory, and thin tree stands for open-woodland species and cavity-nesters such as red-headed woodpeckers. *(Silviculture – land management)*

Priority	Conservation Actions (continued)
Protect suitable grassland and open-field habitat for wildlife	
1º	Use GIS measures, other remote sensing tools, and surveys to identify large expanses of grasslands and protect them (through land acquisition, incentive programs, and regulations) from development, succession, and mechanized agricultural practices. *(Protect habitat – Landscape Project, humans; Agriculture – land management)*
1º	Determine if differences exist in grassland dependent species diversity and abundance in the Northeast between warm season and cool season grass types. *(Agriculture – land management)*
1º	Research different management techniques to understand the appropriateness of prescribed burning, mowing, brush-hogging, and other methods for maintaining suitable habitat for northeastern grassland birds and grassland dependent invertebrates. *(Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify existing grasslands important for endangered, threatened and special concern species; increase the number of large existing grasslands enhanced to support a robust grassland bird community. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify areas where scrub-shrub habitat can be created and/or maintained with little impact to forested, wetland, and grassland habitats to maintain populations of shrub-dependent butterflies and moths, reptiles, amphibians, and scrub-shrub birds such as the yellow-breasted chat, American woodcock, and northern bobwhite quail. *(Protect habitat – Landscape Project)*
1º	Increase the number of acres of grasslands and scrub-shrub habitats protected through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant bog turtle, frosted elfin, silver-bordered fritillary, grassland and scrub-shrub/open field birds, and special concern reptile populations. *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
2º	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Maintain and enhance grassland habitats where they exist; do not expand or create grassland habitat at the expense of large forest that meet the needs of area-sensitive forest species. Acquire grassland habitat through direct purchase or easements; enlist private lands in preservation and management programs that offer long-term (no less than 5 years) stability of a matrix of grassland schemes including various stages of vegetative succession, where appropriate. *(Protect habitat – Landscape Project, development; Enhance habitat – private lands)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote sensing tools, and surveys to identify grassland habitat for grassland birds and American kestrels and increase the number of acres of grassland habitat enhanced for source populations of these species. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
2º	Work to consolidate adjacent grassland fields, through the elimination of hedgerows, fences, or tree lines, in areas where open land occupies a considerable amount of the surrounding landscape and grassland management can be identified as a reasonable management alternative. *(Agriculture – land management)*
Protect suitable aquatic/wetland/riparian habitat and water quality for wildlife and fish species of conservation concern	
1º	Increase the number of acres of freshwater emergent wetlands maintained and enhanced for viable populations of pied-billed grebe, American bittern, black-crowned night-heron, silver-bordered fritillary, clubtail dragonfly and bog turtle. *(Protect habitat – development, sprawl; Enhance habitat – private lands)*
1º	Restore and maintain bog turtle habitat by providing incentives to landowners for long-term management of wet meadows utilizing FWS Region 5 BMPs for bog turtles (prescribed grazing, targeted herbicide application, stem cutting and removal, or a combination of these). *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and best management practices to maintain wetlands with snags of dead trees for red-headed woodpeckers and other cavity-nesters. *(Protect habitat – development, sprawl; Silviculture – land management)*
1º	Work with managers to increase the number of impoundments managed to benefit bitterns, rails, ducks and some invertebrates by providing suitable foraging habitat and encouraging dense stands of emergent vegetation for nesting. *(Protect habitat – humans)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect species dependent upon vernal pool habitat. *(Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*

Priority	Conservation Actions (continued)
2º	Preserve and enhance riparian habitats through regulations, land acquisition, and incentive programs to protect aquatic ecosystems for dwarf wedgemussels, tidewater muckets, and shortnose sturgeon. *(Protect habitat – mussels, fish; Enhance habitat – private lands)*
2º	Encourage stream bank restoration for freshwater mussels through public education, volunteer programs, and land managers. *(Protect habitat – mussels)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. data gaps in species monitoring, distribution, and management. Design and implement coordinated surveys to acquire data in those areas. *(Monitor wildlife – long-term monitoring)*
1º	Through national, standardized survey protocols, utilizing citizen scientists, continue long-term monitoring and survey to collect baseline data (protected lands) of early successional birds (grassland and scrub-shrub), forest songbirds and raptors, reptiles and amphibians (Herptile Atlas and calling amphibian surveys), freshwater mussels and aquatic invertebrate populations (Integrated Aquatic Assessment), and incorporate new information into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Continue coordinated wildlife monitoring and management efforts among conservation groups and state agencies in New Jersey (Citizen Scientist Project, cooperative management efforts on state and permanently-protected conservation lands and adjacent private lands). *(Monitor wildlife – long-term monitoring)*
1º	Promote coordination of species monitoring and management efforts among conservation groups and state agencies in New Jersey by using standardized monitoring and data entry methods for birds and reptiles and amphibians.
1º	Repeat surveys for woodland raptors every four years. *(Monitor wildlife – long-term monitoring)*
1º	Conduct demographic studies (productivity, survival, dispersal) of priority species to provide information needed for determining causes of population declines and understanding metapopulation dynamics. *(Monitor wildlife – long-term monitoring)*
1º	Survey to collect baseline data and develop management strategies for endangered, threatened and special concern wildlife on permanently-protected public lands. Incorporate all data into the Biotics database. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
1º	Survey suitable habitats to determine distribution of barn owls, American kestrels, northern copperheads, and other wildlife of greatest conservation need and establish baseline information for monitoring. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Identify and research water quality parameters for bald eagle, wood turtle, spotted turtle, carpenter frog, Fowler's toad, and other special concern amphibian populations. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Research and evaluate effectiveness of water quality management practices on wood and bog turtles, special concern amphibians, and aquatic invertebrates, particularly those practices associated with permitting or mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Determine population status and monitor trends of forest dwelling bat species in comparison to land use changes and alteration of habitat through long-term acoustical sampling and trapping/netting surveys. *(Monitor wildlife – long-term monitoring)*
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct searches for triangle floaters, frosted elfins, Henslow's sparrows, long-tailed salamanders, eastern mud salamanders, queen snakes, silver-bordered fritillaries, clubtail dragonflies, scarlet bluets, and pink streaks. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by FishTrack Database queries and incorporate data into Biotics database. *(Monitor wildlife – fish)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
Prevent, stabilize, and reverse declines of wildlife and rare fish populations	
1º	Investigate causes of decline and landscape-scale habitat requirements of American kestrels; identify most effective methods to restore and enhance habitat and provide nest cavities (standing dead biomass and nest boxes). *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
1º	Maintain and enhance reptile and amphibian populations by increasing law enforcement (hiring additional officers) and penalties for illegal collection for the pet trade (bog and wood turtles, timber rattlesnakes) and working with state, county, and local DOTs to install raised roads or multiple culverts to reduce road mortality (e.g., along known box turtle breeding locations near roads). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*
1º	Secure bog turtle and wood turtle populations threatened by collection by identifying sources of funding for enforcement of endangered species laws and protection of wildlife from illegal collection. *(Protect wildlife – humans)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors – roads)*
2º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect aquatic wildlife – humans)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Monitor wildlife – fish)*
2º	DFW will collaborate with USDA to identify and prioritize, based upon species of greatest conservation need, areas where rapid response to an exotic pathogen introduction or incident is needed. *(Conserve wildlife – rare wildlife, invasives)*
2º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads; Protect habitat – roads, fish)*
2º	Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species and assess impact of aquatic invasive species on freshwater mussels. *(Protect habitat – mussels)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*
1º	Continue or develop, implement and evaluate methods for both aquatic and terrestrial invasive species removal programs in critical wildlife habitats. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	Support projects, through funding and collaborative efforts, to eliminate aggressive invasive species found on private and public natural lands, especially in large grassland tracts, wet meadow, marsh, emergent wetland, and aquatic habitats. Assess effectiveness of management techniques of invasive species removal on private and public lands. Assess impacts of aquatic invasives on freshwater mussels and implement management strategies to eliminate aquatic invasive species in sensitive or important habitats containing listed freshwater mussels. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
2º	Work with land management agencies to monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the Asian longhorned beetle and gypsy moth. Collaborate on appropriate control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Request permission from private landowners (both those who allow hunting and do not allow hunting) interested in or currently enrolled in incentive programs to establish vegetation monitoring plots. This will allow greater surveillance of deer impacts on private lands, provide landowners direct information about the health of their land, and provide greater data input into the deer harvest formula. *(Evaluate restoration – deer)*
Protect and enhance important and unique habitats	
1º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats, including but not limited to the Sourland Mountains, Princeton Woods, and Assunpink WMA. *(Protect habitat – migratory birds; Corridors – migratory birds)*
2º	Federal, state, and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in the Central Piedmont Plains. *(Protect habitat – Landscape Project)*
2º	Work with local governments and the NJ DEP's Natural Heritage Program (NHP) to protect and enhance habitats and rare communities through incentive programs, land acquisition, the creation and use of BMPs, and increased law enforcement efforts to minimize disturbance. These communities include, but are not limited to the tidal freshwater swamp and sandy bluff natural community and rare plant species at the South River Marshes, the open farmlands at East Amwell Grasslands Macrosite, and the forest at Sourland Mountain Preserve. *(Protect habitat – development)*

Priority	Conservation Actions (continued)
Prevent illegal collection of rare reptiles and amphibians	
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, US Navy Natural Resources Managers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles, timber rattlesnakes), persecution (timber rattlesnakes), and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*
2º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles, corn and pine snakes), persecution (timber rattlesnakes), and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*
Protect and enhance bald eagle habitat	
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with appropriate agencies and organizations to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Promote public education and awareness and wildlife conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Engage landowners in protection efforts for endangered species by increasing enrollment in programs such as Landowner Incentive, Citizen Science and backyard habitat Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Collaborate with partners to develop innovative outreach educational programs to protect important habitats. Promote incentive programs to increase enrollment and encourage agricultural landowners to actively manage for grassland dependent species. *(Education – humans; Agriculture – land management)*

Priority	Conservation Actions (continued)
1º	Educate public about the importance of keeping cats indoors through public service announcements, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies. *(Education – humans; Conserve wildlife – cats, subsidized predators)*
1º	Educate the public, through newsletters, press releases, brochures, presentations, etc., on threats to wildlife, and develop management guidelines for private landowners with significant bald eagle, wood turtle, freshwater wetland bird, grassland bird, woodland raptor, or scrub-shrub/open field bird populations. *(Education – humans; Enhance habitat – private lands)*
1º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop public education brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is key to the successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*

f. Potential partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of forest passerine, freshwater wetland bird, raptor, and scrub-shrub/open field bird populations.
    - Utilize incentive programs that encourage the management of bog turtle, forest and grassland bird populations.
    - Through incentive programs, target private landowners surrounding public natural lands to manage land for mature forest in order to increase effective size and connectivity of forest patches
    - Encourage farmers to preserve farmland through conservation easements and TDRs (Transfer of Development Rights) through partnerships with NJ DEP's Green Acres,

the Nature Conservancy – NJ Chapter, NJ Farm Bureau, SADC, local land trust, and local municipalities for the conservation of bog turtle, forest and grassland bird populations.
    - Develop/maintain cooperative relationships with private landowners with bog turtles and breeding freshwater wetland birds on their land.
    - Collaborate with private landholders to manage grassland and early-succession complexes for source populations of grassland birds, invertebrates, yellow-breasted chats, and American kestrels.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - Work with landowners to maintain/enhance existing habitats where listed and special concern fish species occur.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

<u>Public</u>

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Involve Citizen Scientists in conservation projects, such as stream bank restoration, and searching for undocumented freshwater wetland bird populations.
    - Involve Citizen Scientists in management and protection projects, such as protection and posting of bald eagle nesting areas.
    - Continue volunteer-based summer bat concentration surveys.
- Promote backyard habitat management for migratory raptors and passerines.
- Work with landowners to maintain/enhance existing habitats where listed special concern species occur.
- Educate landowners about the negative impact free-roaming housecats have on wildlife; discourage managed cat colonies and trap, neuter and release programs.

<u>Wildlife Professionals</u>

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub birds and American kestrels.

- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with D&R Greenway, Stony Brook-Millstone Watershed, Sourland Mountain Preserve, NJ Audubon Society, NJ Conservation Foundation, The Nature Conservancy - NJ Chapter, and other conservation organizations to protect and enhance habitats.
    - Protect woodland raptor nesting and foraging sites.
    - Develop best management practices and conservation plans for grasslands and utility rights-of-way.
    - Protect and enhance riparian corridors and early-succession fields.
    - Encourage management of grassland and early-succession complexes for source populations of grassland birds, invertebrates, yellow-breasted chats, and American kestrels.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
    - Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.
- Consult with conservation organizations to develop educational programs, particularly the Keep Cats Indoors campaign.
- Establish data-sharing partnerships to ensure species data from other organizations' surveys are incorporated into the Landscape Project and Office of Natural Lands Management's Natural Heritage Biotics database.
- Encourage the use of priority habitat maps to guide land acquisition by conservation organizations through programs such as NJ DEP's Green Acres, State Agricultural Development Committee (SADC), NJ Farm Bureau, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs, and other farm conservation programs.
- Work with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USDA's NRCS, USFWS - NJ Field Office, SADC, NJ Farm Bureau, and the DCA, Office of Smart Growth, to protect, enhance, and create habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) to protect woodland raptor nesting and foraging sites.

- DFW to develop a plan to prevent collection of bog and wood turtles, and timber rattlesnakes and pine snakes, and to protect sensitive sites (basking, gestation/ nesting, hibernacula) from disturbance.
- DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle and wood turtle sites.
- DFW to determine groundwater recharge areas for bog turtle habitats with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality in these areas.
- Work with DEP's Water Monitoring and Standards to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to work with DEP's Division of Parks and Forestry (DPF) to enhance state forests for wildlife: uneven-age stand management, preserve standing and fallen dead biomass, manage for older-growth forests especially wetland forests and adjacent upland forest, avoid forestry practices in wetland forests.
- DFW and conservation organizations to encourage and provide site information to the NJ Department of Transportation to incorporate multiple culverts in road construction to widen stream flow for fish and wildlife passage and preserve natural streambeds and reduce road mortality by creating wildlife passages across roadways.
- DFW, National Park Service, conservation organizations, and DEP's Lands Use Regulation Program (LURP) to work to protect and appropriately classify wetlands for special concern invertebrate, reptile, and amphibian populations on state, federal, and private lands.
- DFW to lead in the development of specific conservation plans for special concern birds, reptiles, amphibians, and invertebrates on state lands.
- DFW and DPF to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive, non-indigenous plants on federal and state lands and aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
- DFW to work with LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and other forest dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
- DFW, conservation organizations, and land stewards to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, and

invertebrates with the DEP's Division of Watershed Management. Partner with them to investigate water quality and threats of contaminants/pollution.
  - DFW to work with state and county mosquito commissions to reduce the use of deleterious insecticides and biological controls at known amphibian breeding sites.
  - DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
  - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
  - DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
  - DFW and USDA-NRCS to collaborate with SADC and NJ Farm Bureau to implement deer management plans on farmland particularly in areas with high deer densities.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with land stewards, private landowners, and municipal, state and federal staff to establish best management practices in areas where listed or special concern species occur.
  - DFW to collaborate with public landholders to manage grassland and early-succession complexes for source populations of grassland birds, invertebrates, yellow-breasted chats, and American kestrels.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with the DEP's Division of Watershed Management to upgrade stream classifications in areas with rare mussels.
  - DFW to identify areas where scrub-shrub macro-sites can be created and/or maintained for American woodcocks and northern bobwhite quail without negatively affecting endangered, threatened, or special concern species and their habitats.
  - DFW to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, USFWS, and US Department of Agriculture to continue monitoring diseases that can potentially affect wild, native populations of special concern fish species.
  - DFW to continue working with fishing clubs and organizations, lake communities, hatcheries nationwide, and individuals permitted to stock fish in NJ's freshwater streams and lakes to ensure healthy stock is used to minimize the spread of disease and parasites to native fish species and to prevent the use or release of exotic species.
- DFW will lead the development of educational materials for public and private landowners about wildlife of greatest conservation need and associated habitats.
- State agencies, local municipalities, and townships to work together to discourage managed cat colonies and trap, neuter, and release programs.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, and local land trusts, and through mitigation.

- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Annually monitor abundance, productivity, distribution, and trends of bald eagle, bog turtle, and wood turtle populations; priority invertebrate species; colonial waterbird, forest passerine, freshwater wetland bird, grassland bird, raptor, and scrub-shrub/open field bird communities, particularly in areas beyond the reach of the Breeding Bird Survey.
- Determine distribution and expand efforts to track bobcat in the region.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, the Vernal Pool Project, and the volunteer coverboard surveys.
- Conduct long-term monitoring of vegetative plots (exclosures) within state lands to assess vegetative success/ failure over time as deer densities change.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Develop and implement a simple but effective technique to monitor deer impacts on private land (something that landowners can actually use.).
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Continue monitoring diseases as outlined in the DFW's annual Fish Health Management Plan.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

4. Southern Piedmont Plains

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

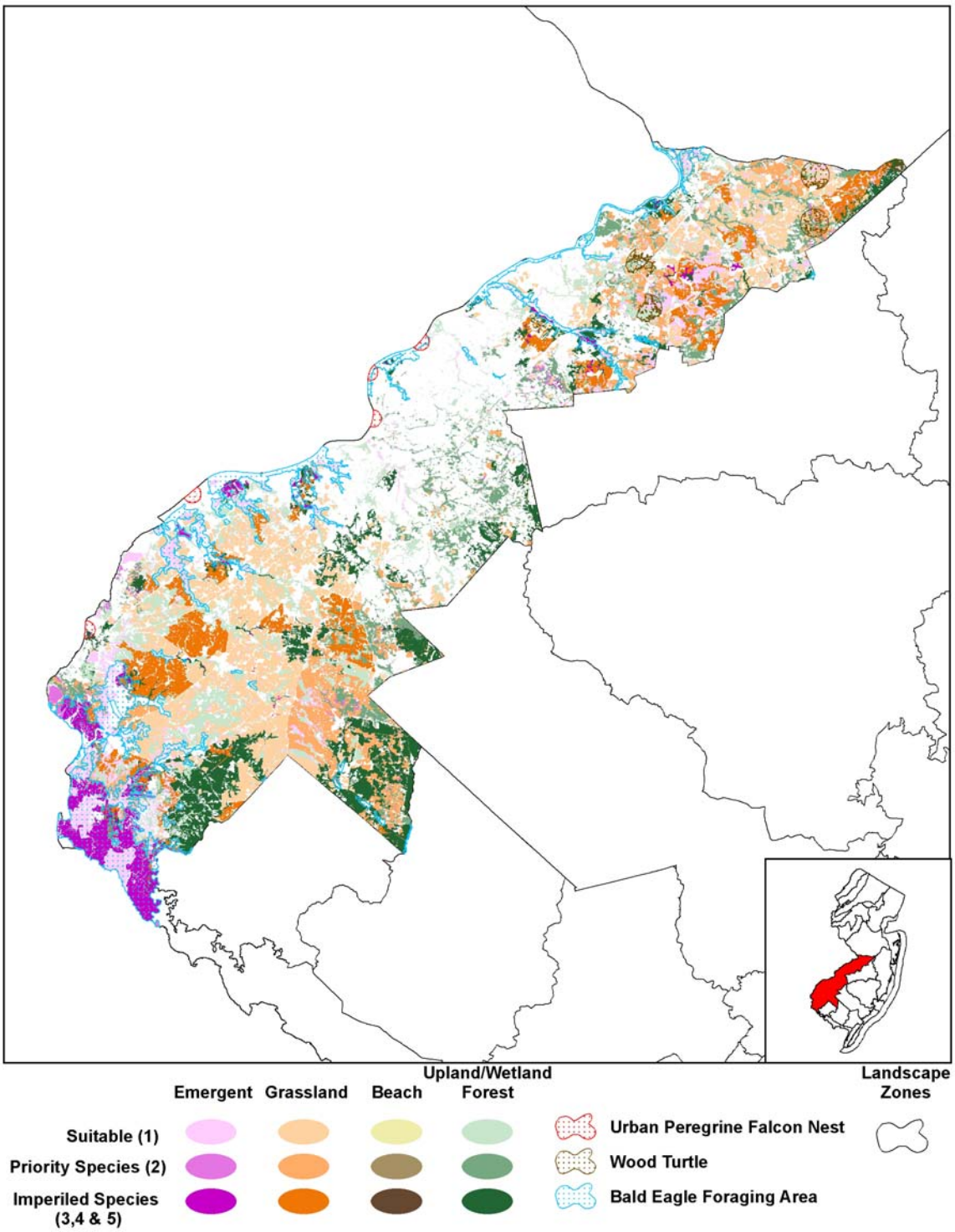
a. Habitats

The Southern Piedmont Plains zone (Figure 21) is the largest zone in the state, with more than 60 percent of the area considered suitable habitat for wildlife of conservation concern. This zone also contains many public natural lands and open space areas including Trenton Marsh, Delaware & Raritan Canal State Park, Rancocas State Park, Parvin State Park, Glassboro WMA, Union Lake WMA, Thundergut Pond WMA, Mannington Meadows WMA, Mad Horse Creek WMA, Abbotts Meadow WMA, Supawna Meadows NWR, Fort Mott, and PSE&G's Alloways Creek.

The Southern Piedmont Plains zone begins just north of Trenton and follows the Delaware River south to the southwest border of Salem County. This zone contains the Delaware River and estuary, which is composed of two important systems – the freshwater tidal river from Trenton to Camden and the brackish upper estuary from Camden to the Cohansey River. The estuary system is composed of brackish and freshwater tidal marshes, tidal flats, and slow moving streams. Tidal freshwater marshes are among New Jersey's most rare yet most valuable habitat types. The Southern Piedmont Plains zone contains the largest concentration of this valuable habitat type. Geologically, this zone is actually within the inner coastal plain physiographic province and includes some of the richest soils in New Jersey. Grasslands are also an important component of the estuary and the region. Grassland habitats in this region include fens, wet meadows, impounded agricultural lands, and upland agricultural lands. Important bald eagle and osprey populations are found here. Bog turtle populations are currently found at the northern end of this zone.

Mad Horse Creek WMA in Salem County is at the southwestern tip of this zone and is characterized by extensive emergent marshland and agricultural lands, much of which is heavily farmed. Salem and Gloucester counties have extensively farmed areas but larger forest and forested wetland complexes are found throughout these counties as well. The domination of row crops provides limited habitat for grassland dependent species. However, area-sensitive, grassland-dependent species such as the upland sandpiper and vesper sparrow are found in large grasslands. Effective management of farmland habitat could help reverse population declines of grassland-dependent wildlife. Maintaining the integrity of existing forests and forested wetlands is also critical in this area since they take many years to mature. These forests should be protected from fragmentation as they provide habitat for wide-ranging species such as forest dwelling bats, bobcats, barred owls, Cooper's hawks, and forest passerines. Wood turtles and other declining reptiles and amphibians also rely on this important habitat.

Figure 21. Critical landscape habitats within the Southern Piedmont Plains conservation zone, as identified through the Landscape Map (v2).



b. Wildlife of Greatest Conservation Need

The Southern Piedmont Plains supports one federal endangered species, one federal threatened species, 14 state endangered, 15 state threatened, 76 special concern and regional priority wildlife species, and 13 additional harvested species of regional priority. The bald eagle, bog turtle, and American burying beetle are the federally listed species. The state endangered species include the bobcat, American bittern, northern harrier, peregrine falcon, pied-billed grebe, red-shouldered hawk, sedge wren, upland sandpiper, vesper sparrow, eastern tiger salamander, and timber rattlesnakes. State threatened wildlife species include the barred owl, black-crowned night-heron, bobolink, Cooper's hawk, grasshopper sparrow, long-eared owl, osprey, red-headed woodpecker, savannah sparrow, northern pine snake, wood turtle, Pine Barrens treefrog, eastern pondmussel, triangle floater, yellow lampmussel, and frosted elfin. Special concern wildlife species include cavity-nesters, colonial waterbirds, forest passerines, freshwater wetland birds, grassland birds, migratory songbirds, raptors, and scrub-shrub/open field birds, other reptiles, amphibians, and invertebrates. Tidal freshwater emergent marshes in this area are significant spring staging areas for northern pintails that winter in the Atlantic Flyway. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, occur here.

The Southern Piedmont Plains is notable for supporting urban nesting peregrine falcons. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats the Southern Piedmont Plains

Table PP31. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Reptiles				
Bog turtle		X	X	X
Mussels				
Dwarf wedgemussel	X ***			
Fish				
Shortnose sturgeon	X			

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
***Riverine habitat.
X: Species occurs within the identified habitat.

Table PP32. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat		X		X
Birds				
American bittern		X		X
Bald eagle		X	X	X
Henslow's Sparrow		R	R	
Northern harrier		X	X	
Peregrine falcon		X		
Pied-billed grebe		X		
Red-shouldered hawk				X
Sedge wren		X	X	
Short-eared owl			X	
Upland sandpiper			X	

State Endangered Species (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Vesper sparrow			X	
Reptiles				
Timber rattlesnake				X
Queen snake		R		R
Amphibians				
Blue-spotted salamander		R		R
Eastern tiger salamander		X		X
Insects				
Bronze copper			X	X

R: Proposed reintroduction of species.
X: Species occurs within the identified habitat.

Table PP33. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night-heron		X		
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Northern pine snake				X
Wood turtle				X
Amphibians				
Eastern mud salamander		X		
Pine Barrens treefrog		X		
Mussels				
Eastern pondmussel	X*			
Tidewater mucket	X*			
Triangle floater	X*			
Yellow lampmussel	X*			
Insects				
Frosted elfin		X	X	

*Riverine habitat.
X: Species occurs within the identified habitat.

Table PP34. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern small-footed myotis				X**
Eastern red bat				X**
Hoary bat				X**
Marsh rice rat			X	
Silver-haired bat				X**
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American golden-plover			X	
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blue-winged warbler		X		X
Broad-winged hawk				X
Brown thrasher				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Cattle egret		X		
Chimney swift				X
Chuck-will's-widow				X
Cliff swallow		X	X	
Common barn owl			X	
Common nighthawk			X	X
Dickcissel			X	
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Forster's tern		X		
Glossy ibis		X		
Gray catbird				X
Great blue heron		X		X
Great crested flycatcher				X
Great egret		X		
Green heron		X		X
Hooded warbler				X
Horned lark			X	
Indigo bunting			X	X
Kentucky warbler				X
King rail		X		
Least bittern		X		
Least flycatcher				X
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern gannet		X		
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Purple finch				X
Red-throated loon		X		
Rose-breasted grosbeak				X
Scarlet tanager				X
Seaside sparrow		X		
Sharp-shinned hawk				X
Snowy egret		X		
Spotted sandpiper		X		
Summer tanager				X
Veery				X
Whip-poor-will				X
Willet		X		
Willow flycatcher				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Coastal plain milk snake		X		X
Eastern box turtle			X	X
Eastern kingsnake				X
Northern diamondback terrapin		X		
Spotted turtle				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Amphibians				
Carpenter frog		X		X
Fowler's toad		X		X
Mussels				
Creeper	X***			
Insects				
A noctuid moth, *Chytonix sensilis*				X
A noctuid moth, *Cucullia alfarata*			X	
A noctuid moth, *Macrochilo louisiana*			X	
A noctuid moth, *Macrochila santerivalis*			X	
A noctuid moth, *Macrochilo sp 1*			X	
A slugmoth, *Monoleuca semifascia*			X	X
A spanworm, *Itame sp 1*				X
Doll's merolonche, *Merolonche dolli*				X
Lemmer's pinion moth, *Lithophane lemmeri*				X
Pink streak, *Faronta rubripennis*	X			X
Precious underwing, *Catocala pretiosa pretiosa*				X
Rare skipper, *Problema bulenta*				X
Scarlet bluet, *Enallagma pictum*	X	X	X	
Zanclognatha sp 1		X	X	X
Fish				
American brook lamprey*	X			
Atlantic sturgeon	X			
Bridle shiner	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy - NJ Chapter
**Potential presence.
***Riverine habitat.
X: Species occurs within the identified habitat.

Table PP35. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		X
American woodcock				X
Canada goose (Atlantic population)	X	X		
Canvasback	X			
Clapper rail		X		
Greater scaup	X			
Lesser scaup	X			
Northern bobwhite			X	
Northern pintail	X			
Surf scoter	X			
Virginia rail		X		
Wood duck				X
Fish				
Brook trout*	X			

*Species is a New Jersey game species, but is also an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table PP36. Fish Species

Common Name	Water
Fish	
Comely shiner	X
Hickory shad	X
Ironcolor shiner	X
Margined madtom	X
Rainbow smelt	X

X: Species occurs within the identified habitat.

Table PP37. Game Species

Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		
Birds				
Ruffed grouse				X
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Although much of this zone retains a rural, farmland character, critical wildlife habitat is threatened in many ways, the greatest of which are fragmentation and disturbance. Roads and development destroy and degrade habitat and are barriers to wildlife movements. Land subject to intensive farming practices decreases habitat value for wildlife. Run-off of pesticides and other contaminants (e.g., PCBs) from residential and agriculture areas into waterways impact breeding success of eagles, ospreys, and amphibians. Ditching, draining, and filling of marshes eliminates habitat and degrades the remaining surrounding areas. This zone is situated entirely within the ports of Wilmington, Delaware and Philadelphia, Pennsylvania, which together support some of the largest petro-chemical facilities in the U.S. As such, this zone faces spill and contaminants related threats that could be potentially catastrophic. Shipping channel expansion or deepening in the Delaware River could have significant implications on salinity levels in tidal freshwater emergent marshes. Disturbance of marsh areas by personal watercraft adversely impacts marsh breeding birds and erodes the water's edge. Invasive species such as common reed or Phragmites (*Phragmites australis)*, multi-flora rose, bull thistle, and autumn olive eliminate habitat for most grassland and marsh nesting birds. Aquatic nuisance species may render some freshwater systems unsuitable for many fish and aquatic invertebrate species. Breeding populations of non-native trout (brown and rainbow) resulting from stocking for recreational use compete with native populations of brook trout. Furthermore mallards, which thrive in areas with human habitation, compete with and displace American black ducks and have also been known to hybridize with them. In this zone, American black ducks occur along the Delaware River and in western Salem County. In riparian areas, North American beavers can create wetland habitat suitable for many species by damming up streams, but may, in turn, alter riparian habitat downstream from the dam.

White-tailed deer thrive in fragmented non-urban areas and the resulting over-browse of the forest system in this landscape is severe and virtually eliminates forest regeneration. White-tailed deer also selectively browse native vegetation, giving invasive species (barberry species, etc) a stronghold in the forested understory. In addition, fragmented forests face an increased risk of invasion of aggressive weed species such as garlic mustard, Japanese honeysuckle, barberry, oriental bittersweet, and Japanese knotweed. This eliminates habitat for ground-nesting birds and basking and foraging areas for many amphibians and reptiles.

Fragmenting the core integrity of forests and forested wetlands in this zone also threatens critical habitat for forest-interior species such as the bobcat, barred owl, red-shouldered hawk and forest passerines. Clear-cutting of forests renders the habitat unsuitable for many area sensitive forest species. Re-establishing mature forest and forested wetlands takes many years and in particular, Atlantic white cedar swamps are difficult to re-establish once eliminated.

Clearing of vegetation along rivers and streams is a leading cause of habitat loss, fragmentation, and degradation of riparian and aquatic ecosystems. Loss of vegetated buffers along streams and rivers increases runoff of contaminants from roads and developed areas, impacting aquatic communities and the terrestrial wildlife that rely on them. Roads and development that bisect riparian systems are barriers to wildlife movements, isolating less mobile wildlife populations (particularly reptiles, amphibians and fish) and increasing the risk of local extinctions. Also see Section I-E “Threats to Wildlife and Habitats” (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitat through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and/or restore important grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height) to maintain viable populations of area-sensitive grassland species and declining scrub-shrub species.
- Maintain large tracts of forest and forested wetlands to sustain and restore viable populations of area-sensitive forest species (bobcat, woodland raptors, forest-interior birds, wood turtle, timber rattlesnake).
- Identify, protect, maintain, enhance, and restore critical aquatic, riverine and wetland habitats and water quality to preserve aquatic ecosystems, particularly for marsh nesting birds, freshwater mussels, rare damselflies and dragonflies, nongame fish species and game fish of regional priority that rely on high water quality.
- Inventory, determine distribution, and monitor wildlife and fish species of greatest conservation need.
- Prevent, stabilize, and reverse declines of wildlife, including rare freshwater mussels and special concern fish species.
- Assess large-scale habitat change (every five to 10 years).
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Protect and enhance important and unique natural communities.

- Prevent illegal collection of rare reptiles and amphibians (including bog and wood turtles and timber rattlesnakes) and of Asiatic (or Asian) clams, which potentially damage native mussel populations through treading and disturbance of the streambed.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Protect and enhance bald eagle, osprey, and peregrine falcon nesting, foraging and roosting habitat.
- Promote public education and awareness and wildlife and fish conservation.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Piedmont Plains Regional Landscape stakeholders during a meeting held on September 7, 2006 (see *Attachment F*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife populations through Landscape Project critical habitat mapping	
1°	Use GIS measures, other remote sensing tools, and surveys to identify critical core habitats and assess their condition for early successional species (grassland-and scrub shrub), forest passerines, cavity nesters, bald eagles, coastal marsh birds, bog turtles, mollusks of special concern, reptiles, amphibians, and butterflies and moths of special concern .Integrate the data into the Biotics database. *(Protect habitat – Landscape Project)*
1°	Develop and implement a habitat improvement and restoration program for coldwater fish. *(Protect habitat – fish)*
1°	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
1°	Provide technical assistance and promote use of Landscape Project mapping in state land-use regulation, municipal planning, land acquisition priorities, and development of management strategies for permanently protected lands. *(Protect habitat – Landscape Project)*
1°	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Provide long-term protection for bald eagle habitats, including land acquisition and protection. *(Protect habitat – humans; Conserve wildlife – development, rare wildlife)*
2º	Act to protect, maintain, and/or restore habitat as appropriate for bald eagles, ospreys, and peregrine falcons. *(Protect habitat – humans; Conserve wildlife – development, rare wildlife)*
2º	Enlist Citizen Science volunteers to monitor and protect nests from human disturbance. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*
2º	Minimize disturbance at bald eagle nest sites by immediately notifying the DFW law enforcement of any activities that may lead to nest abandonment or failure. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Identify all permanently protected land (e.g., fee simple, easements) for incorporation into the publicly available Open Space GIS layer to assist conservation-oriented organizations to identify potential critical habitat tracts and connective corridors that are part of, adjacent to, or in proximity of, already protected areas. *(Protect habitat – Landscape Project)*
2º	Develop baseline data and management strategies for endangered, threatened, and special concern wildlife on permanently protected natural lands. Incorporate all data into the Biotics database. *(Monitor wildlife – long-term monitoring)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Protect rare mussels and fish through regulations from Category 1 upgrades in water bodies where listed or special concern species occur. *(Protect habitat – mussels)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife - fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Identify and protect important coldwater fish habitat and ecosystems through the Fishtrack database and water quality regulations. *(Protect habitat – fish)*
Protect and enhance open-field habitats to maintain area-sensitive grassland species.	
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core grassland habitat and act to protect, enhance, and/or restore habitat through fee purchase, conservation easement, landowner incentives, and/or management plans. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote sensing tools, and surveys to identify areas where scrub-shrub habitat can be created and/or maintained with little impact to forested, wetland, and grassland habitats to maintain populations of shrub-dependent butterflies and moths, reptiles, amphibians, and scrub-shrub birds such as the yellow-breasted chat, American woodcock and northern bobwhite quail. *(Protect habitat – Landscape Project)*
1º	Survey suitable habitats annually to determine distribution and trends of grassland and scrub-shrub dependent species including the bronze copper, frosted elfin, northern harrier and upland sandpiper. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Investigate causes for decline and develop models based on habitat requirements of American kestrel and barn owl; identify most effective methods to restore and enhance habitat and provide nest cavities (standing dead biomass and nest boxes). *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project)*
1º	Increase the number of acres with an established mosaic of meadow, hay and row crops within open field habitats. Utilize incentive programs for funding. Evaluate/monitor productivity of grassland birds within these habitats. *(Agriculture – land management; Conserve wildlife – rare wildlife)*
1º	Conduct demographic studies (productivity, survival, dispersal) of priority species to provide information needed for determining causes of population declines and understanding metapopulation dynamics. *(Monitor wildlife – long-term monitoring)*
1º	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed through public education and incentive programs. Increase the number of acres converted from existing hay and/or row crops to warm season grass fields, where appropriate, using landowner incentive programs. Evaluate effectiveness of delayed mowing between warm season grass fields and cool season hay fields for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. *(Protect habitat – humans; Enhance habitat – private lands)*
1º	Research different management techniques to understand the appropriateness of prescribed burning, mowing, brush-hogging, and other methods for maintaining suitable habitat for northeastern grassland-dependent species including birds, reptiles and amphibians, and invertebrates. *(Monitor wildlife – long-term monitoring; Agriculture – land management)*
2º	Maintain and enhance grasslands and habitats where they exist; do not expand or create grassland and early-successional habitat at the expense of large forest that meet the needs of area-sensitive forest species. Acquire grassland habitat through direct purchase or easements; enlist private lands in preservation and management programs that offer long-term (no less than 5 years) stability of a matrix of grassland schemes including various stages of vegetative succession, where appropriate. *(Protect habitat – Landscape Project, development; Enhance habitat – private lands)*

Priority	Conservation Actions (continued)
2º	Where appropriate, create large grasslands areas by eliminating hedgerows, fences, or tree lines in areas where open land occupies a considerable amount of the surrounding landscape and grassland management is a reasonable management alternative. *(Agriculture – land management)*
Maintain large tracts of forest and forested wetlands	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core forests (forest area >90 meters from the forest edge) and maintain information in the Biotics database. Preserve and protect core forests through regulations, land acquisition, and incentive programs for forest-interior passerines and bobcats (≥ 10 hectares or 24.7 acres of core forest), forest raptors (≥ 100 hectares or 247 acres of contiguous forest), Indiana bats (≥ 6.8 hectares or 17 acres of contiguous forest) per the Forest Management Guidelines for Nongame Species in New Jersey, and timber rattlesnakes (if unknown foraging habitat, a minimum of 1 ½ mile radius surrounding known den locations or 4,521 acres). Focus preservation efforts in forests that are at least 2,500 meters from major highways. Work to prevent activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). Identify adjacent habitats to core forests that can be preserved and/or managed to increase the total size of forest habitat. *(Protect habitat – Landscape Project; Silviculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest raptors (red-shouldered hawk, barred owl), forest-interior songbirds (Acadian flycatcher, scarlet tanager, wood thrush, pine warbler, Kentucky warbler), bobcats, and northern pine snakes where appropriate.. Take action to minimize habitat loss by protecting, maintaining, enhancing and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Increase the effective size and connectivity of forested habitats and corridors through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. Revegetate stream and riparian corridors to create a network of habitat for wildlife passage through agricultural and developed landscapes. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, northern pine snakes, bobcats, Indiana bats, Acadian flycatchers, scarlet tanagers, wood thrush, pine warblers, Kentucky warblers, and waterfowl) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and upland forests for forest-interior passerines (managing for mature deciduous forests with >80% canopy closure and open understory; moist deciduous and mixed forests with structural diversity; pine and mixed pine forests with sparse understory). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature and managed to create future barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Continue to monitor barred owl distribution. Increase the number of acres of forest managed for larger trees with a canopy closure of > 80% through incentive programs, public education, and collaboration with forest managers. Preserve old growth Atlantic white cedar swamps and mixed forested wetlands through regulations, land acquisition and incentive programs. *(Monitor wildlife – long-term monitoring; Silviculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to select woodlots to manage for structural forest diversity, especially shrub and subcanopy understory for forest passerines (Kentucky warblers, Louisiana waterthrushes, wood thrushes), priority reptiles, amphibians, and invertebrate species. *(Silviculture – land management)*
1º	Discourage forestry practices that result in fragmentation of forest core areas of at least 10 hectares (24.7 acre). *(Silviculture – land management)*
1º	Use GIS measures and other remote sensing tools, surveys, incentive programs, and public education to select and manage woodlots to maintain dead trees, reduce understory, and thin tree stands for open-woodland species and cavity-nesters such as red-headed woodpeckers. *(Silviculture – land management)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote sensing tools, and surveys to identify, protect, and maintain coniferous forests with >70% forest cover to protect and maintain them, through land acquisition, incentive programs, and public education, for priority bird species (black-throated green warbler, blue-headed vireo, northern parula), reptiles and amphibians. *(Protect habitat –Landscape Project)*
Maintain and restore critical habitat and water quality for aquatic/wetland/riparian species.	
1º	Protect water quality by maintaining optimal biological buffers beyond regulatory requirements around wetlands, riparian and floodplain areas and minimize destruction per the Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey. Encourage native plantings through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
1º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*
1º	Wetlands used as breeding sites should be protected from chemical contamination, siltation, eutrophication, and other forms of pollution/contamination that could directly harm wetland-dependent species (birds, invertebrates, reptiles, amphibians) or their food supply. Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*
1º	Protect water quality by and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish)*
1º	Preserve and protect, through regulations and enforcement, land acquisition, and incentive programs, occupied and potential habitat for black rails and sedge wren and surrounding wetlands. *(Protect habitat – rare wildlife, development, humans)*
1º	Maintain and enhance, through regulations, land acquisition, and incentive programs, critical wetland habitat for sedge wrens, American bitterns, rails, night-herons, Pine Barrens treefrogs, and eastern tiger salamanders. *(Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and best management practices to maintain wetlands with snags of dead trees for red-headed woodpeckers and other cavity-nesters. *(Protect habitat – development; Silviculture – land management)*

Priority	Conservation Actions (continued)
1º	Increase the number of freshwater wetlands managed for pied-billed grebes and other wetland dependent species including rails, waterfowl, and invertebrates: create impoundments, maintain stable water levels during nesting season, restrict recreational activity, monitor contaminant levels; hemi-marsh conditions (area with approximately 50% water and 50% emergent vegetation cover) favored by grebes need to be maintained by periodic reversal of vegetation succession to open up some of the extensive stands of emergent vegetation. Suitable habitat for nesting needs to be maintained in nearby areas during wetland management. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
1º	Protect all large (> 4.9 hectares, 12.1 acres) freshwater wetlands from development, draining, pollutants from runoff and other forms of habitat loss and degradation through regulations, land acquisition, fee purchase, conservation easements, and incentive programs. *(Protect habitat – development, humans)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess wetland and riparian habitat and act to protect, enhance, and/or restore habitat through fee purchase, conservation easement, landowner incentives, and/or management plans. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect species dependent upon vernal pool habitat. *(Conserve wildlife – rare wildlife)*
1º	Restore and maintain bog turtle habitat by providing incentives to landowners for long-term management of wet meadows utilizing USFWS Region 5 BMPs for bog turtles (prescribed grazing, targeted herbicide application, stem cutting and removal, or a combination of these). *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify critical emergent wetlands and estuarine marsh. Develop riparian GIS layer and incorporate into Landscape Project mapping. *(Protect habitat – Landscape Project)*
2º	Preserve and enhance riparian habitats through regulations, land acquisition, and incentive programs to protect aquatic ecosystems for tidewater muckets and shortnose sturgeon. *(Protect habitat – mussels, fish; Enhance habitat – private lands)*
2º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project *(Protect habitat – Landscape Project)*
2º	Develop a fish Index of Biotic Integrity (IBI) to better assess, manage, restore and protect New Jersey's non-trout streams in the Lower Delaware River Drainage.
2º	Protect non-trout streams in the Lower Delaware River Drainage through regulations by seeking Category 1 classifications in stream segments with high levels of biological integrity based on fish assemblages. *(Protect habitat – fish)*

Priority	Conservation Actions (continued)
2º	Protect non-trout streams in the Lower Delaware River Drainage by seeking other appropriate classifications for stream segments based on IBI results. *(Protect habitat – fish)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Survey suitable habitats to determine distribution and trends of the shortnose sturgeon, dwarf wedgemussel, blue-spotted salamander, queen snake, bronze copper, frosted elfin and other species with little known distribution patterns in this zone. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Conduct surveys to determine distribution of bobcats and expand efforts through increased funding and public outreach to track bobcats in the Southern Piedmont. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Through national, standardized long-term monitoring, utilizing citizen science volunteers, continue long-term monitoring and survey to collect baseline data (protected lands) of grassland and scrub-shrub birds, forest songbirds and raptors, reptiles and amphibians (Herptile Atlas and calling amphibian surveys), freshwater mussels and aquatic invertebrate populations (Integrated Aquatic Assessment), and incorporate new information into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Promote coordination of species monitoring and management efforts among conservation groups and state agencies in New Jersey by using standardized monitoring and data entry methods for birds and reptiles and amphibians. *(Conserve wildlife – rare wildlife)*
1º	Conduct surveys in Delaware River tributaries every four years to determine distribution of eastern pondmussels, tidewater muckets and yellow lampmussels. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Conduct surveys in suitable, previously unsurveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. *(Monitor wildlife – fish)*
1º	Determine population status and monitor trends of forest dwelling bat species in comparison to land use changes and alteration of habitat through long-term acoustical sampling and trapping/netting surveys. *(Monitor wildlife – long-term monitoring)*
1º	Research and evaluate effectiveness of water quality management practices on marsh nesting birds, eastern tiger salamanders, bog turtles, and aquatic invertebrates, particularly those practices associated with permitting and mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct landscape and habitat analyses to determine carrying capacity of freshwater tidal marshes for spring staging waterfowl of conservation concern. *(Conserve wildlife – game species)*
2º	Conduct surveys to find more information about the species and management requirements of rails and sedge wrens. *(Monitor wildlife – long-term monitoring)*
2º	Systematically monitor fish populations, including native, wild trout, to keep management strategies current, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
2º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by FishTrack Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife -fish)*
Prevent, stabilize, and reverse declines of wildlife, including rare freshwater mussel and special concern fish species	
1º	Maintain and enhance reptile and amphibian populations by increasing law enforcement (hiring additional officers) and penalties for illegal collection for the pet trade (bog and wood turtles, timber rattlesnakes, pine snakes) and working with state, county, and local Dots to install raised roads or multiple culverts to reduce road mortality (e.g., along known box turtle breeding locations near roads). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors – roads)*
1º	Work with managers to increase the number of impoundments managed to benefit bitterns, rails, ducks and some invertebrates by providing suitable foraging habitat and encouraging dense stands of emergent vegetation for nesting. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
2º	Seek Category 1 upgrades for Pompeston Creek and other tributaries with listed aquatic species. *(Conserve wildlife – rare wildlife)*
2º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Conserve wildlife – rare wildlife)*
2º	Monitor and develop management strategies for coldwater fisheries in large reservoirs. *(Protect habitat – humans)*
2º	Study how land use practices such as ditching, impounding, dredging, open marsh water management, burning, and marsh restoration impact species in this suite. *(Conserve wildlife – rare wildlife)*
2º	Develop management strategies to assure the protection of the state's valuable wild coldwater fisheries. *(Protect habitat – humans)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Conserve wildlife – rare wildlife)*
2º	DFW will collaborate with USDA to identify and prioritize, based upon species of greatest conservation need, areas where rapid response to an exotic pathogen introduction or incident is needed. *(Conserve wildlife – invasives)*
2º	Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species. *(Protect habitat – mussels, Landscape Project)*
2º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads; Protect habitat – roads, fish)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.

Priority	Conservation Actions (continued)
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	Develop programs with partner organizations to effectively and efficiently remove invasive weed species from key areas. *(Conserve wildlife – invasives)*
1º	Continue or develop, implement and evaluate methods for both aquatic and terrestrial invasive species removal programs in critical wildlife habitats. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Support projects, through funding and collaborative efforts, to eliminate aggressive invasive species found on private and public natural lands, especially in large grassland tracts, wet meadow, marsh, emergent wetland, and aquatic habitats. Use surveys to assess effectiveness of management techniques of invasive species removal on private and public lands and the impacts of aquatic invasives on freshwater mussels. Implement management strategies to eliminate aquatic invasive species in sensitive or important habitats containing listed freshwater mussels. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
1º	Continue to develop and expand incentives for harvesting antlerless deer such as "earn-a-buck." *(Conserve wildlife – deer)*

Priority	Conservation Actions (continued)
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife – deer)*
2º	Work with land management agencies to monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the Asian longhorned beetle and gypsy moth. Collaborate on appropriate control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Request permission from private landowners (both those who allow hunting and do not allow hunting) interested in or currently enrolled in incentive programs to establish vegetation monitoring plots. This will allow greater surveillance of deer impacts on private lands, provide landowners direct information about the health of their land, and provide greater data input into the deer harvest formula. *(Evaluate restoration – deer)*
2º	Monitor and evaluate the impacts of vegetative damage to the wild rice marshes by resident Canada geese. Develop, implement, and evaluate management strategies to maintain and enhance the wild rice marshes by minimizing goose damage and controlling resident Canada goose populations. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
Prevent illegal collection of rare reptiles, amphibians, and Asiatic (or Asian) clams	
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents and NWR officers, US Army Natural Resources Managers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles, timber rattlesnakes and pine snakes), persecution (timber rattlesnakes), and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*

Priority	Conservation Actions (continued)
2º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles), persecution (timber rattlesnakes), and human disturbance (off-road-vehicles, clam harvesting). *(Protect wildlife – humans)*
Protect and enhance important and unique habitats	
1º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats, including but not limited to the Glassboro WMA. *(Protect habitat – migratory birds; Corridors – migratory birds)*
1º	Continue to support (through cooperative research and funding) the protection of habitats, including but not limited to the tidal brackish marsh and river drainages of Mannington Meadows Macrosite, the hardwood swamp natural community and federal threatened plant species at Glassboro Woods in Glassboro WMA, and the tidal freshwater marshes along the Delaware River. *(Protect habitat – development; Conserve wildlife – rare wildlife)*
2º	Federal, state, and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in the Southern Piedmont Plains. *(Protect habitat – Landscape Project)*
2º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to protect and enhance habitats and rare plant communities through incentive programs, land acquisition, the creation and use of BMPs, and increased law enforcement efforts to minimize disturbance. These communities include, but are not limited to, the high quality floodplain forest natural community at Walnford Floodplain, the hardwood swamp natural community and federal threatened plant species at United States Ave, Hidden Lake, Toms Branch, and Campus Swamp sites. *(Protect habitat –development)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Develop and implement a habitat improvement and restoration program for coldwater fish. *(Restore aquatic habitat - development)*
1º	Monitor changes in water quality and assess the impacts to the native trout populations on specific waterways where native, wild, summer trout habitat may be in jeopardy due to declining water quality. *(Monitor wildlife – fish)*
2º	Continue to classify waters according to their suitability for native, wild trout, and provide recommendations for surface water classification changes to the Department of Environmental Protection. *(Protect habitat – fish)*

Priority	Conservation Actions (continued)
Conserve and enhance wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect habitat – humans)*
Maintain and enhance habitat critical for bog turtles, ospreys, bald eagles, and peregrine falcons	
2º	Restore and maintain bog turtle habitat; provide incentives to landowners for long-term management of wet meadows by implementing prescribed grazing. *(Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitat for ospreys and peregrine falcons. Actively protect, monitor, and manage nests to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the appropriate agencies and organizations to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Promote public education and awareness and wildlife and fish conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	Restore and enhance habitat on private lands through active partnerships with non-governmental organizations and local, state, and federal partners. Promote existing landowner incentive programs, through newsletters, press releases, brochures, presentations, etc., to increase enrollment and protect important habitat for rare species management. *(Conserve wildlife – development; Enhance habitat – private lands)*
1º	Develop and maintain educational brochures and posters, and viewing and recreational opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
1º	Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs. Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies. *(Education – humans; Conserve wildlife – cats, subsidized predators)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Engage landowners in protection efforts for endangered species by increasing enrollment in programs like the Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Collaborate with partners to develop innovative outreach educational programs to protect important habitats. Promote incentive programs to increase enrollment and encourage agricultural landowners to actively manage for grassland dependent species. *(Education – humans; Agriculture – land management)*
2º	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of bald eagle, forest passerine, freshwater wetland bird, raptor, and scrub-shrub/open field bird populations.
    - Utilize incentive programs that encourage the management of bog turtle, forest and grassland bird populations.
    - Utilize landowner incentive programs to protect water quality and riparian habitat in areas where rare mussels occur.
    - Through incentive programs, target private landowners surrounding public natural lands to manage land for mature forest in order to increase effective size and connectivity of forest patches.
    - Encourage farmers to preserve farmland through conservation easements and Transfer of Development Rights (TDRs) through partnerships with NJ DEP's Green Acres, the Nature Conservancy – NJ Chapter, SADC, NJ Farm Bureau, local land trusts, and local municipalities for the conservation of bog turtle, forest and grassland bird populations.
    - Develop/maintain cooperative relationships with private landowners with bog turtles, bald eagles, and breeding freshwater wetland birds on their land.
    - Work with landowners to maintain/enhance riparian areas through stream bank restoration and planting native vegetation.
    - Work with landowners to protect water quality by minimizing use of fertilizers and pesticides.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - Work with landowners to maintain/enhance existing habitats where listed and special concern fish species and native trout populations occur.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.

    - Involve Citizen Scientists in conservation projects, such as stream bank restoration, and searching for undocumented freshwater mussels and wetland bird populations.
    - Involve Citizen Scientists in management and protection projects, such as protection and posting of bald eagle nesting areas.
    - Continue volunteer-based summer bat concentration surveys.
- Distribute habitat management booklets (grassland, vernal pool, backyard habitat) to landowners with appropriate habitat to encourage good stewardship of their properties.
- Collaborate/partner with local conservation groups (D&R Greenways) in their on-the-ground outreach efforts (clean-ups, restoration plantings, festivals, etc.).
- Promote backyard habitat management for reptiles and amphibians, invertebrates, migratory raptors, and passerines.
- Work with landowners to maintain/enhance existing habitats where special concern species occur.
- Work with landowners to maintain/enhance existing trout populations.
- Educate public about keeping cats indoors; discourage managed cat colonies and trap, neuter and release programs.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field and grassland birds.
- Collaborate with the National Native Mussel Conservation Committee and other experts to develop best management practices for areas with listed and special concern species.
- Work with the American Museum of Natural History to maintain existing NY/NJ freshwater mussel web site.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with conservation organizations to protect and enhance habitats.
    - Protect bald eagle, peregrine falcon, osprey and woodland raptor nesting and foraging sites.
    - Protect important foraging, basking, and den sites for timber rattlesnake and northern pine snakes.
    - Protect important vernal pond sites and the surrounding upland habitat.
    - Protect nesting and foraging sites for scrub-shrub/ open field and grassland birds.
    - Develop best management practices and conservation plans for utility rights-of-way.
    - Protect and enhance riparian habitats for aquatic and semi-aquatic species, as well as riparian users.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
    - Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.
- Consult with conservation organizations to develop educational programs.
- Support and collaborate with D&R Greenway's efforts to preserve and enhance Trenton Marsh.

- Develop management guidelines and implementation strategies for species/habitats under conservation easements in cooperation with the easement holder (land trusts, conservation organizations, state and federal agencies) and landowner.
- Establish data-sharing partnerships to ensure species data from other organizations' surveys are incorporated into the Landscape Project and the Biotics database.
- Encourage the use of priority habitat maps to guide land acquisition by conservation organizations through programs such as Green Acres Program, State Agricultural Development Committee (SADC), NJ Farm Bureau, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Continue to develop partnerships with fishing- and conservation-oriented organizations to increase conservation and restoration efforts on streams and lakes that provide trout fishing opportunities.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs, and other farm conservation programs.
- Work with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands
- Continue to develop partnerships with fishing and conservation oriented organizations to increase conservation and restoration efforts on streams and lakes that provide trout fishing opportunities.

<u>Local Government, Other State and Federal Agencies</u>

- Partner with local, state, and federal government agencies, including municipal and county planning boards, USFWS - NJ Field Office, SADC, NJ Farm Bureau, and USDA's NRCS, and the DCA, Office of Smart Growth to protect, enhance, and create habitats, and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) to protect bald eagle and woodland raptor nesting and foraging sites.
    - DFW and the DEP's Division of Parks and Forestry (DPF) to protect nesting and foraging sites for scrub-shrub/ open field and grassland birds.
    - DFW and the USFWS to develop a plan to protect sensitive bald eagle, bog turtle, and wood turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle and wood turtle sites.
    - DFW will lead in the prevention of the illegal harvesting of Asian (or Asian) clams, which potentially damages native mussel populations through treading and disruption of habitat.
    - DFW to work with the DEP's Land Use Regulation Program (LURP) to protect and appropriately classify wetlands for special concern reptile and amphibian populations.
    - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
    - DFW to lead in the development of specific conservation plans for special concern birds, reptiles, amphibians, and invertebrates on state lands.

- DFW and DPF to work with the USFWS and National Park Service to develop effective plans to eradicate invasive, non-indigenous plants on federal and state lands and aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
- DFW to work with LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- Continue to interact with other state agencies on operational, regulatory, and land-use issues to ensure adequate consideration is given to coldwater fish resources.
- Continue to participate in the review of Land Use Applications that have the potential to impact wild trout populations.
- DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
- DFW and USDA-NRCS to collaborate with SADC and NJ Farm Bureau to implement deer management plans on farmland particularly in areas with high deer densities.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and other forest dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
- DFW, conservation organizations, and land stewards to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels.
- DFW to work with state and county mosquito commissions to reduce the use of deleterious insecticides and biological controls at known amphibian breeding sites.
- DFW to determine groundwater recharge areas for bog turtle habitats with the DEP's Division of Water Quality and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality in these areas.

  - DFW to work with the Division of Watershed Management and the DEP's Bureau of Water Monitoring and Standards to recommend stream classification upgrades in stream segments where listed mussel species and other special concern species occur.
  - Collaborate with DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years
  - DFW to identify areas where scrub-shrub macro-sites can be created and/or maintained for American woodcocks and northern bobwhite quail without negatively affecting endangered, threatened, or special concern species and their habitats.
  - DFW to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW, USFWS, and US Department of Agriculture to continue monitoring diseases that can potentially affect wild, native populations of special concern fish species.
  - DFW to continue working with fishing clubs and organizations, lake communities, hatcheries nationwide, and individuals permitted to stock fish in NJ's freshwater streams and lakes to ensure healthy stock is used to minimize the spread of disease and parasites to native fish species and to prevent the use or release of exotic species.
  - DFW to continue to interact with other state agencies on operational, regulatory, and land-use issues to ensure adequate consideration is given to coldwater fish resources.
  - DFW to continue to participate in the review of Land Use Applications that have the potential to impact wild trout populations.
  - DFW will work with DEP's Bureau of Water Monitoring and Standards to recommend appropriate stream classifications
- DFW will lead the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through colonial waterbird viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Annually monitor abundance, productivity, distribution, and trends of bald eagle, bog turtle, and wood turtle populations; and of colonial waterbird, forest passerine, freshwater wetland bird, grassland bird, raptor, and scrub-shrub/open field bird communities, particularly in areas beyond the reach of the Breeding Bird Survey.
- Monitor contaminant levels that may impact bald eagle populations.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, the Vernal Pool Project, and the volunteer coverboard surveys.

- Conduct surveys for listed and special concern freshwater mussel species every four years to monitor populations.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants and fish.
- Conduct long-term monitoring of vegetative plots (exclosures) within state lands to assess vegetative success/ failure over time as deer densities change.
- Continue to monitor deer densities and deer harvest data.
- Develop and implement a simple but effective technique to monitor deer impacts on private land.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Continue monitoring diseases as outlined in the DFW's annual Fish Health Management Plan.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

Pinelands Landscape

Contents of the Chapter on the Pinelands Landscape

The Pinelands Landscape, or the "Pine Barrens," is the vast tract of pitch-pine forest that extends from the Atlantic coast into south-central New Jersey. The Pinelands extend through Ocean, Burlington, Camden, Gloucester, and Atlantic counties, with a total area equaling 474,331 hectares (1,831 sq. mi.). The Great Egg Harbor and Mullica Rivers and the Barnegat Bay watershed are the largest aquatic features of the Pinelands.

A. Ecological Units in the Pinelands Landscape

The Pinelands are within the New Jersey Outer Coastal Plain (232Ab) in the Middle Atlantic Coastal Plain Section.

B. Geology and Climate

The Pinelands are within the Coastal Plain physiographic province. The Pinelands have broad valleys that gently rise from the Atlantic coast to hills no higher than 60 meters (196 feet). The average temperature across the Pinelands is between 10 to 12º C (50 to 53.6º F) and the growing season varies from 180 to 225 days. The annual precipitation averages between 101 and 116 cm (39 and 45 inches).

C. Habitats and Conservation Priority Areas of the Pinelands Landscape

The Pinelands (Figure 22) stretch to the vast tidal salt marshes before the barrier islands and to the inner coastal plain along the west, with the Delaware Bay landscape to the south and the Piedmont Plains to the north. Pitch pine-oak forests dominate the Pinelands (318,542 hectares, 1,229 sq. mi.) and these forests are plentiful with wetlands – sluggish streams, white cedar swamps, hardwood swamps, cranberry bogs – and open to broad tidal estuaries before the Atlantic coast (18,269 hectares or 70 sq. mi. of wetlands). Upland agriculture and grasslands make up 35,782 hectares (138 sq. mi.) of the Pinelands. It is important to note that habitats identified as "grassland" within the Landscape Map and throughout this document include agricultural lands and therefore, are not necessarily suitable habitats for grassland species.

Similarly, scrub-shrub habitat is included in the "forest" and "forested wetlands" habitats on the Landscape Maps.

State law has protected the Pinelands ecosystem and its unique wildlife and habitats since 1979, when the New Jersey Legislature passed the Pinelands Protection Act. This action followed the passing of federal legislation in 1978, which directed New Jersey to establish a Commission for the Pinelands and to allocate funds for land acquisition and planning in this region. Development within most of the Pinelands National Reserves is now overseen by the Pinelands Commission, which controls growth pursuant to its Comprehensive Management Plan (CMP).

Conservation Zones in the Pinelands Landscape are:

(1) Southern Pinelands
(2) Western Pinelands
(3) Mullica River Watershed
(4) Northern Pinelands

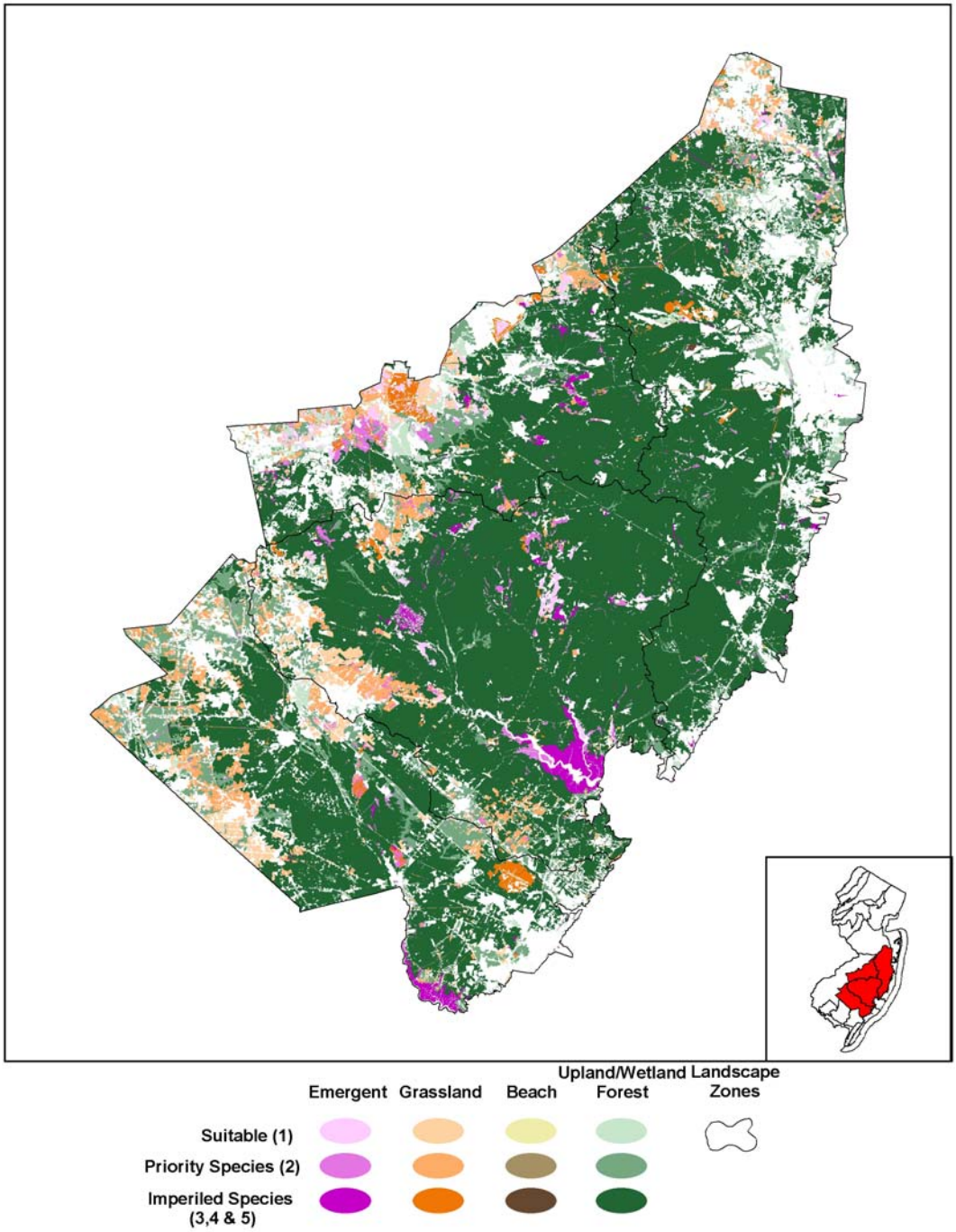
Within the Pinelands Landscape Region, conservation zones are delineated by watershed boundaries (Watershed Management Areas or WMAs), which the New Jersey Department of Environmental Protection's Division of Watershed Management has established. The Southern Pinelands Zone is comprised mainly of the Great Egg Harbor Watershed (WMA 15), but also contains a small portion of the northern edge of the Maurice, Salem, Cohansey Watershed (WMA 17). The Western Pinelands Zone contains a very small portion of the Lower Delaware Watershed (WMA 18), with the remainder of the zone made up of the Rancocas Watershed (WMA 19) and the Assiscunk, Crosswicks, Doctors Watershed (WMA 20). The largest of the four zones in this region is the Mullica River Watershed Zone, which is comprised entirely of the Mullica Watershed (WMA 14). The Northern Pinelands Zone is primarily contained within the Barnegat Bay Watershed (WMA 13), but also includes a small portion of the Monmouth Watershed (WMA12) and Lower Raritan, South River, Lawrence Watershed (WMA 9).

D. Wildlife of Greatest Conservation Need of the Pinelands Landscape

With its unique habitats, the Pinelands Landscape is host to several threatened and endangered species that are found in few other areas of New Jersey. Species such as Pine Barrens treefrog, corn snake, timber rattlesnake, arogos skipper, and pine snake occur as disjunct populations in the Pinelands, with no natural connections to other populations of these species. This high degree of isolation makes proper habitat management of the Pinelands Landscape essential for the long-term viability of these species in New Jersey. The large contiguous forest patches of the Pinelands are also important for nesting forest passerines and as migratory bird stopovers. This landscape region is therefore crucial for the viability of these species as well. The habitats in the Pinelands play an accessory role for species and species groups such as eastern box turtles, northern diamondback terrapins, grassland birds, and osprey.

The Pinelands support one federal threatened species, 12 state endangered species, 15 state threatened species, and more than 60 special concern/regional priority wildlife species. The

Figure 22. Critical landscape habitats within the Pinelands Landscape and associated conservation zones as identified through the Landscape Map (v2).



Pinelands host a number of imperiled habitat-specialists, including corn snake, northern pine snake, and Pine Barrens treefrog. Bald eagles, cavity-nesters, forest passerines, raptors and scrub-shrub/open field birds inhabit the forests and fields of this region. Coastal plain milk snakes, eastern box turtles, eastern kingsnakes, spotted turtles, timber rattlesnakes, wood turtles, Cope's gray treefrogs, carpenter frogs, Fowler's toads, and marbled salamanders populate the pine forests, forested wetlands, meandering streams, swamps, and bogs. The region's forests and riparian areas are also known to host populations of forest-dwelling bats and may contain habitat suitable for summer colonies of Indiana bats. Finally, the Pinelands have large tracts of suitable habitat capable of supporting remnant bobcat populations.

The following tables list the wildlife of greatest conservation need, the suites of wildlife, and the conservation opportunity areas to conserve them in the Pinelands Landscape. The wildlife are prioritized by federal endangered and threatened, state endangered, state threatened, and special concern and regional priority status.

Prioritized List of the Wildlife of Greatest Conservation Need and their Location in the Pinelands Landscape

Table P1. Federal Endangered and Threatened Species*

Common Name	Fed Status & Regional Priority	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Mammals					
Indiana bat	E	R**	R**	R**	R**
Reptiles					
Bog turtle	T		I		I

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
T: Federally threatened species.
E: Federally endangered species.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table P2. State Endangered Species

Common Name	Regional Priority	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Mammals					
Bobcat					R
Birds					
American bittern	RP		I		
Bald eagle	T	I	I	I	I
Black skimmer	RP	M		M	M
Least Tern	RP				M
Red-shouldered hawk		I	I	I	I
Upland sandpiper	RP	I			I
Vesper sparrow			I		I
Reptiles					
Corn snake				I	I
Timber rattlesnake			I	I	I
Amphibians					
Cope's gray treefrog					I

State Endangered Species (continued)

Common Name	Regional Priority	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Insects					
Arogos skipper			I	I	

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table P3. State Threatened Species

Common Name	Regional Priority	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Birds					
Barred owl		I	I	I	I
Black-crowned night heron	RP	I		I	I
Bobolink		I	I		
Cooper's hawk	RP	I	I	I	I
Grasshopper sparrow	RP	M	M		X
Osprey		M		M	M
Red-headed woodpecker	RP	I	I	I	I
Savannah sparrow			M		X
Yellow-crowned night heron	RP	M			
Reptiles					
Northern pine snake		I	I	I	I
Wood turtle					I
Amphibians					
Eastern mud salamander			R	R	
Pine Barrens Treefrog		I	I	I	I
Invertebrates					
Frosted Elfin		I			
Silver-bordered fritillary			I		

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table P4. Nongame Species of Conservation Concern

Common Name	Conservation Status	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Mammals					
Eastern red bat	RP	R*	R*	R*	R*
Eastern small-footed myotis	S1, G3	R*	R*	R*	R*
Hoary bat	RP	R*	R*	R*	R*
Marsh rice rat	S3, G5	X	X	X	X
Silver-haired bat	RP	R*	R*	R*	R*
Southern bog lemming	S2, G5	X	X	X	X
Birds					
Acadian flycatcher	RP	M	M	M	M
American kestrel	SC	I	I	I	I
Baltimore oriole	RP	I	I	I	I
Black-and-white warbler	RP	I	I	I	I
Black-billed cuckoo	RP	I	I	I	I
Black-throated green warbler	SC	I	I		I
Blue-winged warbler	RP	I	I	I	I
Broad-winged hawk	SC/ RP	M	M	M	M
Brown thrasher	RP	M	M	M	M
Cattle Egret	RP	M			
Cerulean warbler	SC/ RP	M			M
Common Barn owl	SC	I	I	I	I
Common nighthawk	SC	M	M	M	M
Dickcissel	RP		M	M	
Eastern kingbird	RP	M	M	M	M
Eastern meadowlark	SC/ RP	M	M	M	M
Eastern screech-owl	RP	M	M	M	M

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Birds (continued)					
Eastern towhee	RP	I	I	I	I
Eastern wood-pewee	RP	I	I	I	I
Field sparrow	RP	I	I	I	I
Gray catbird	RP	M	M	M	M
Great blue heron	SC/ RP	M	M	M	M
Great crested flycatcher	RP	I	I	I	I
Great egret	RP	M	M	M	M
Green heron	RP	M	M	M	M
Hooded warbler	RP	M	M	M	
Horned lark	SC	M	M		M
Indigo bunting	RP	M	M	M	M
Kentucky warbler	SC/ RP	I	I	I	
King rail	SC/ RP	M	M	M	
Least flycatcher	SC/ RP	I		I	I
Little blue heron	SC/ RP	M		M	M
Louisiana waterthrush	RP	M	M	M	M
Marsh wren	RP	M		M	M
Northern flicker	RP	I	I	I	I
Northern parula	SC	M	M	M	M
Pine warbler	RP	M	M	M	M
Prairie warbler	RP	I	I	I	I
Prothonotary warbler	RP	I	I	I	
Rose-breasted grosbeak	RP	I	I	I	I
Saltmarsh sharp-tailed sparrow	RP	M		M	M
Scarlet tanager	RP	I	I	I	I
Seaside sparrow	RP	M		M	M
Snowy egret	SC/ RP	M		M	M
Spotted sandpiper	SC	M	M	M	M
Tricolored heron	SC/ RP	M		M	M
Veery	SC	I	I	I	
Whip-poor-will	RP	I	I		I
Wood thrush	RP	I	I	I	I
Worm-eating warbler	RP	M	M	M	M
Yellow-billed cuckoo	RP	I	I	I	I
Yellow-breasted chat	SC/ RP	M	M	M	M
Yellow-throated vireo	RP	I	I	I	I
Yellow-throated warbler	RP	M		M	M
Reptiles					
Coastal plain milk snake	SC	M	M	M	M
Eastern box turtle	SC	M	M	M	M
Eastern kingsnake	SC	M	M	M	M
Northern diamondback terrapin	SC	M		M	M
Spotted turtle	SC	M	M	M	M
Amphibians					
Carpenter frog	SC	M	M	M	M
Fowler's toad	SC	M	M	M	M
Marbled salamander	SC	M		M	M
Northern Spring Salamander	SC				M
Insects					
A geometrid moth *Idaea violacearia*	S1S3, G4			M	
A geometrid moth *Metarranthis sp 1*	S2, G3		M		
A noctuid moth *Apharetra dentata*	S2S3, G4		M	M	M
A noctuid moth *Macrochilo louisiana*	S2S3, G4			M	
A noctuid moth *Macrochilo sp 1*	S3, G3		M		
A noctuid moth *Meropleon cosmion*	S1S2, G4			M	

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Insects (continued)					
A noctuid moth *Chytonix sensilis*	S1S3, G4			M	
A slugmoth *Monoleuca semifascia*	S2S3, G4G5	M			
A spanworm *Itame sp 1*	S3, G3		M	M	M
Buchholz's gray *Hypomecis buchholzaria*	S3, G3G4		M	M	M
Carter's noctuid moth *Spartiniphaga carterae*	S2, G2G3		M	M	M
Chain fern borer moth *Papaipema stenocelis*	S3, G4	M		M	
Daecke's pyralid moth *Crambus daeckellus*	S1S3, G1G3		M		M
Doll's merolonche *Merolonche dolli*	S1S3, G3G4		M	M	M
Dotted skipper *Hesperia attalus*	SC, S2S3, G3G4	M	M	M	M
Granitosa fern moth *Callopistria granitosa*	S2S3, G4G5		M	M	
Hessel's hairstreak *Callophrys hesseli*	SC, S3S4, G3G4			M	M
Lemmer's pinion moth *Lithophane lemmeri*	S2, G3G4	M		M	M
Pine Barrens bluet *Enallagma recurvatum*	S3, G3		M	M	M
Pine Barrens zale *Zale sp 1*	S3, G3Q			M	M
Pink streak *Faronta rubripennis*	S3, G3G4	M	M		M
Pitcher plant borer moth *Papaipema appassionata*	S2S3, G4			M	
Placentia tiger moth *Grammia placentia*	S1S3, G4		M	M	M
Rare skipper *Problema bulenta*	S2, G2G3			M	
Scarlet bluet *Enallagma pictum*	S3, G3	M	M	M	M
Southern ptichodis *Ptichodis bistrigata*	S1S3, G3			M	M
The consort, or consors underwing *Catocala consors sorsconi*	S1S3, G4			M	
Two-spotted skipper *Euphyes bimacula*	SC, S3, G4		M	M	M
Fish					
American brook lamprey**	RP		X		
Banded sunfish**	RP	X	X	X	X
Black-banded sunfish	RP	X	X	X	X
Mud sunfish	RP	X	X	X	X

*Potential presence.
**Species are also recognized as target species of ecoregional concern by the Nature Conservancy – NJ Chapter.
SC: Species of special concern as identified within the state.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
S & G: Conservation Ranks defined in Appendix I
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

Table P5. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Species of Regional Priority	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Birds					
American black duck	RP	I	I	I	I
American woodcock	RP	I	I	I	I
Canada goose (Atlantic population)	RP	M	M	M	M
Northern bobwhite	RP	R	R	R	R
Virginia rail	RP	R	R	R	R
Wood duck	RP	M	M	M	M

RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table P6. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Regional Priority	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Fish					
Ironcolor shiner	-	X			
Margined madtom	-		X		
Pirate perch	-	X	X	X	X
Shield darter	-				X

X: Species present. Management strategy not yet determined.

Table P7. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Regional Priority	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Mammals					
River otter	-	M	M	M	M
Birds					
Ruffed grouse	-	R	R	R	R
Sora rail	-	R	R	R	R

M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table P8. Suites of Wildlife and their Location in the Pinelands Landscape

Common Name	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Mammals				
Forest Dwelling Bats	X	X	X	X
Birds				
Beach-nesting Birds			X	X
Interior-forest Cavity-nesters	X	X	X	X
Savannah and Forest-edge Habitat Cavity-nesters	X	X	X	X
Coastal High Marsh Birds	X		X	X
Coastal Low Marsh Birds	X		X	X
Colonial Waterbirds	X	X	X	X
Forest Passerines	X	X	X	
Forest Raptors	X	X	X	X
Freshwater Wetland Birds		X	X	

Suites of Wildlife and their Location in the Pinelands Landscape (continued)

Common Name	Southern Pinelands	Western Pinelands	Mullica River Watershed	Northern Pinelands
Birds (continued)				
Grassland Birds	X		X	
Migratory Shorebirds			X	X
Migratory Songbirds & Raptors		X	X	X
Scrub-shrub/Open Field (3-7 yrs) Birds	X	X	X	X
Early Succession (0 -3 years) Open Field Birds	X	X	X	X
Waterfowl	X	X	X	X
Reptiles				
Forest Dwelling Reptiles	X	X	X	X
Reptile Inhabitants of Wetland, Marsh and Bog	X	X	X	X
Reptiles Associated with water (lakes, ponds, streams)	X	X	X	X
Reptiles of Special Concern	X	X	X	X
Amphibians				
Amphibians of Special Concern	X	X	X	
Vernal Pool and Vernal Sinkhole Breeders	X	X	X	X
Insects				
Lepidoptera of Federal or State Legal Status	X	X	X	X
Lepidoptera of Special Concern	X	X	X	X
Odonata	X	X	X	X

X: Species occurs within the identified habitat.

E. Threats to Wildlife and Habitats of the Pinelands Landscape Region

The Pinelands Commission regulates development throughout much of the Pinelands Landscape; however, habitat loss and fragmentation remain the largest threat to wildlife in this region. Areas outside the regulatory boundaries of the Pinelands National Reserve (PNR) are at the highest risk of development, and large acreages of critical habitats continue to be modified by development in these areas. Within the PNR, development is directed into “Regional Growth” and “Rural Development” management areas and away from environmental sensitive areas, such as those within the “Forest Area” and “Preservation Area District”.

Changes in groundwater quantity and quality, along with inter-watershed transport of groundwater, threaten the productivity and health of amphibians and other wildlife. Research has shown that surface water quality decreases for Pinelands wildlife as pH levels rise in association with residential and commercial development and upland agriculture. This “buffering effect” has a negative impact on native Pinelands wildlife because it allows for non-Pinelands species to colonize sites that would normally be too acidic. The unlawful use of off-road vehicles on public and private lands also threatens sensitive species and habitats through destruction of vegetation, soil compaction, and direct mortality of rare reptiles and amphibians. Over-browsing by deer, fire suppression, and invasive insect infestations also represent significant threats to native Pinelands wildlife.

F. Conservation Zones, Assessments, and Strategies within the Pinelands Landscape

1. Southern Pinelands

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

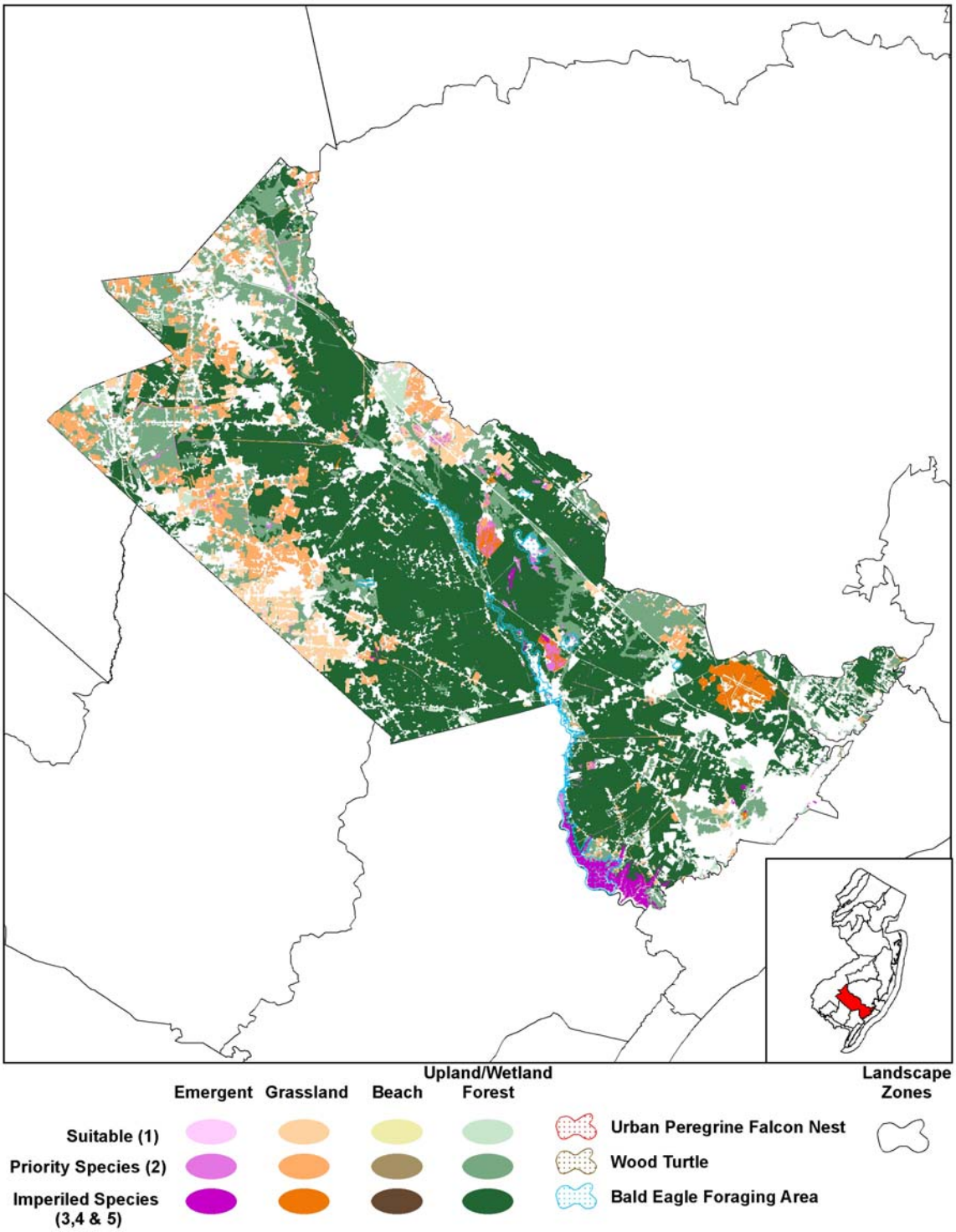
The Southern Pinelands Conservation Zone is primarily comprised of land within the Great Egg Harbor Watershed. Portions of Atlantic, Camden and Gloucester counties are contained in this zone (Figure 23). Deciduous forests, pitch pine-oak forests, and farmland characterize this landscape. The Pinelands National Reserve extends through this zone (72% of the total area), but 19% of this zone is classified as "urban" according to NJ DEP's 95/97 Land-Use, Land-Cover (LULC) data. Large state-owned land holdings in this area include Winslow WMA and Makepeace Lake WMA. The Atlantic City Airport is also located in the Southern Pinelands and contains extensive grassland bird habitat and possibly the largest global population of frosted elfin.

b. Wildlife of Greatest Conservation Need

The Southern Pinelands support three state endangered, eight state threatened, 67 nongame species of conservation concern, and several important game species. Bald eagle, black skimmer, red-shouldered hawk, and upland sandpiper are state endangered, and state threatened species include barred owl, black-crowned night heron, Cooper's hawk, red-headed woodpecker, northern pine snake, Pine Barrens treefrog, and frosted elfin. Special concern wildlife include cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, scrub-shrub/open field birds, reptiles, amphibians, and butterflies. In addition, summer populations of forest-dwelling bat species occur in the Southern Pinelands.

Large patches of deciduous upland forest and forested wetland provide important habitat for barred owls. The forests (including forested wetlands) also support bald eagle, Cooper's hawk, and Pine Barrens treefrog populations; provide nesting sites for cavity-nesters, habitat for forest passerines, raptors; coastal plain milk snake, eastern box turtle, eastern kingsnake, spotted turtle, carpenter frog, Fowler's toad, and marbled salamander populations. Freshwater wetland birds and colonial waterbirds inhabit Southern Pineland wetlands along the Great Egg Harbor River. The grasslands on the Atlantic City Airport property support the largest population of frosted elfins in the state, and contain breeding upland sandpipers and grasshopper sparrows. Tables P9 – P15 identify the species of greatest conservation need within this zone.

Figure 23. Critical landscape habitats within the Southern Pinelands conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Southern Pinelands

Table P9. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana Bat				X**

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
T: Federally threatened species.
X: Species occurs within the identified habitat.

Table P10. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Bald eagle		X	X	X
Red-shouldered hawk				X
Upland Sandpiper			X	

X: Species occurs within the identified habitat.

Table P11. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night heron		X		
Cooper's hawk				X
Grasshopper sparrow			X	
Red-headed woodpecker				X
Reptiles				
Northern pine snake			X	X
Amphibians				
Pine Barrens Treefrog		X		X
Invertebrates				
Frosted Elfin			X	

X: Species occurs within the identified habitat.

Table P12. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern red bat				X*
Eastern small-footed myotis				X*
Hoary bat				X*
Marsh rice rat		X		
Silver-haired bat				X*
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Black-throated green warbler				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Cattle egret		X		
Cerulean warbler				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Common Barn owl			X	
Common nighthawk				
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Great blue heron		X		
Great crested flycatcher			X	
Great egret		X		
Green heron		X		
Hooded warbler				X
Horned lark			X	
Indigo bunting			X	
Kentucky warbler				X
King rail		X		
Least flycatcher				X
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Rose-breasted grosbeak				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Snowy egret		X		
Spotted sandpiper		X		
Tricolored heron		X		
Veery				X
Whip-poor-will				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Coastal plain milk snake				X
Eastern box turtle			X	X
Eastern kingsnake				X
Northern diamondback terrapin		X		
Spotted turtle			X	X
Amphibians				
Carpenter frog				X
Fowler's toad		X	X	X
Marbled salamander				X
Insects				
A slugmoth *Monoleuca semifascia*				X
Carter's noctuid moth *Spartiniphaga carterae*			X	
Dotted skipper *Hesperia attalus*			X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Insects (continued)				
Lemmer's pinion moth *Lithophane lemmeri*				X
Pink streak *Faronta rubripennis*				X
Scarlet bluet *Enallagma pictum*		X	X	
Fish				
Banded sunfish**	X			
Black-banded sunfish	X			
Mud sunfish	X			

*Potential presence.
**Species are also recognized as target species of ecoregional concern by the Nature Conservancy – NJ Chapter.
X: Species occurs within the identified habitat.

Table P13. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck		X		
American woodcock			X	X
Canada goose (Atlantic population)	X	X		
Northern bobwhite quail			X	X
Virginia Rail		X		
Wood duck		X		X

X: Species occurs within the identified habitat.

Table P14. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Ironcolor shiner	X
Pirate perch	X

X: Species occurs within the identified habitat.

Table P15. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Southern Pinelands

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf.

The Southern Pinelands have extensive tracts of critical wildlife habitat, yet habitat loss and fragmentation still constitute major threats to wildlife. At its eastern edge, this landscape has been greatly modified by development in Egg Harbor and Galloway townships. Similar changes have taken place in Monroe Township in the northwestern portion of this zone. Nonetheless, important habitats still remain for barred owls, Pine Barrens treefrogs, northern pine snakes, frosted elfins, and other rare wildlife. The effects of deer and invasive insect species, such as the southern pine beetle, may have a considerable impact on forest health in the Southern Pinelands. Protecting large forest patches, maintaining intact wetlands and riparian corridors, and managing existing grasslands are the key components to proper habitat management within this conservation zone. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, maintain, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of forest and forested wetlands as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife including interior-forest raptors and passerines, northern pine snake, freshwater wetland birds, frosted elfin, rare reptiles and amphibians, and rare dragonflies, damselflies, butterflies, and moths.
- Identify, protect, maintain, enhance, and restore important early succession (areas comprised of <5% woody vegetation, with a mix of native grasses, forbes and bare soil) as identified by the Landscape Project for grassland birds and scrub-shrub/open field wildlife populations.
- Identify, protect, maintain, enhance, and restore critical aquatic ecosystems, riverine and riparian habitats, and water quality to preserve aquatic ecosystems particularly for species of conservation concern that rely on high water quality or low pH waters such as rare amphibians, and native fish.
- Protect and restore characteristic Pinelands communities.
- Preserve the ecological quality and integrity of wetland habitats and vernal pool communities.
- Inventory, determine distribution, and monitor wildlife and nongame fish species of greatest conservation need.
- Prevent, stabilize, and reverse declines of interior-forest raptors and passerines, northern pine snake, freshwater wetland birds, frosted elfin, rare reptiles and amphibians, and rare dragonflies, damselflies, butterflies, and moths, grassland and scrub-shrub/open field wildlife populations, freshwater mussels, and native Pinelands fish species such as the blackbanded sunfish, banded sunfish, mud sunfish, and pirate perch.
- Prevent illegal collection of rare reptiles and amphibians.

- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness and wildlife conservation.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Pinelands Regional Landscape stakeholders during a meeting held on June 13, 2007 (see *Attachment I*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Action
Protect critical habitats identified by the Landscape Project and critical aquatic habitats	
1°	Review existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat - Landscape Project)*
1°	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
Protect critical forest and forested wetlands habitats identified in the Landscape Project	
1°	Use GIS measures, other remote sensing tools, and surveys to identify and assess critical core forests for forest-interior songbirds, forest raptors (red-shouldered hawk, barred owl, long-eared owl), forest-dwelling bats, Pine snakes, corn snakes, and bald eagles. Take action to minimize habitat loss and maintain large core areas by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, forest management and stewardship plans. Maintain information in the Landscape Project and Biotics database, and provide this information to the Pinelands Commission. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*

Priority	Conservation Action (continued)
1º	Manage forests on a regional scale to provide a mix of seral (successional) stages for a wide range of forest-dwelling species (e.g., woodland raptors, northern pine snakes, pine warbler, black-throated green warbler, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. These forest types include but are not limited to: mature and near-mature forests with large trees, > 80% canopy closure and an uneven-age structure; mature forests with 65-85% canopy closure and structural diversity; pine-oak savanna with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing healthy Pinelands forests. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and wildlife surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*
2º	Develop a species occurrence area of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). As GIS data layers become available, develop a predictable model of Indiana bat summer habitat. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
Protect critical early successional habitats identified in the Landscape Project	
1º	Research different techniques for maintaining suitable habitat for species dependent on early successional habitats (e.g., prescribed burning, mowing, brush-hogging, and other methods). *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing early succession habitats which will improve habitat quality for grassland- and scrub-shrub-dependent species. BMPs will be implemented on large patches on public lands, and areas such as at the Atlantic City Airport (grassland areas with >75 % herbaceous and <25% woody vegetation), and along utility line rights-of-way (scrub-shrub). *(Protect habitat – humans; Conserve wildlife – rare wildlife; Agriculture – land management; Other practices – land management)*
2º	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed; this can be accomplished through public education and incentive programs. Continue to evaluate the effectiveness of delayed mowing for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. *(Protect habitat – humans; Enhance habitat –private lands)*
2º	Use GIS measures, other remote sensing tools, and wildlife surveys to identify grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for mowing, prescribed burning) strategies to maintain and enhance these habitats in perpetuity. Focus on habitat patches that can be managed at a size and scale that is similar to historic patch size of this habitat type as being researched by the Pinelands Commission as part of their "Right-of-way Project." *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height), assess their condition for nesting birds (golden-winged warbler and woodcock) and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create them. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*

Priority	Conservation Action (continued)
Protect critical riverine and riparian habitats identified in the Landscape Project	
2º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl), forest-interior songbirds, timber rattlesnakes, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Identify and protect habitat for fish by performing QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and plotting distributions of special concern fish species (as identified by the Delphi process), and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
Protect and restore characteristic Pinelands communities	
1º	Restore the dynamic nature of this ecosystem by developing management plans for state lands which incorporate the needs of Pinelands plants and animals and generate the spatial patch diversity needed by species within this community. *(Conserve wildlife – rare wildlife)*
1º	Research different management techniques (e.g., ecologically-based forestry activities, prescribed burns) that might be used to mimic the historic role of fire and other natural disturbances in shaping this ecosystem. Implement appropriate management actions in areas where natural disturbances, such as wildfire, have been precluded. *(Conserve wildlife – rare wildlife)*
1º	Identify, enhance, and restore Atlantic white cedar communities within the Pinelands for black-throated green warblers, red-shouldered hawks, barred owls, and Cooper's hawks. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify rare and unique Pinelands plant communities and increase protection for these areas through acquisition, proper management, or increased enforcement. *(Protect habitat - Landscape Project)*

Priority	Conservation Action (continued)
2º	Work with the Division of Parks and Forestry including the Office of Natural Lands Management, the Forest Fire Service, and Forest Service to determine the historic and future role of fire in the creation and management of unique Pinelands communities. *(Conserve wildlife – rare wildlife)*
2º	Develop, implement, and evaluate best management practices (BMPs) for utility line rights-of-way that favor the establishment and persistence of native, early-successional Pinelands communities. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
Preserve the ecological quality and integrity of wetlands and vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool-dependent species. *(Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat – private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
2º	Maintain stream water chemistry/ water quality important for species native to the Pinelands by limiting developed land and upland agriculture to less than 10% of a watershed. For example, maintain low pH waters important for breeding populations of carpenter frogs. *(Conserve wildlife – rare wildlife; (Protect habitat – rare wildlife)*
Inventory and monitor endangered, threatened, and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.
1º	Conduct surveys for dragonflies and damselflies in appropriate habitats throughout the Southern Pinelands to determine species distributions and identify habitat protection needs. *(Enhance habitat – odonata)*
1º	Determine baseline abundance and establish long-term monitoring programs for wildlife of greatest conservation need (e.g., develop population estimates for rare Pineland species and conduct range-wide surveys every four years). *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Action (continued)
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for endangered, threatened, and native Pinelands species. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills and common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Monitor wildlife – long-term monitoring)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by Fish Track Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of rare wildlife, freshwater mussels, and native Pinelands fish species	
1º	Evaluate and assess the potential impacts of wind turbines to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on birds and bats. *(Protect habitat - humans)*
1º	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Division of Parks and Forestry to designate riding areas and BMPs should be developed. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*

Priority	Conservation Action (continued)
1º	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g. wildlife underpasses, road closures). *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement proactive habitat conservation goals that will meet and maintain recovery needs of endangered and threatened wildlife and fish populations, particularly for those restricted to the Pinelands region. These include guidelines for forest silviculture on public and private lands to enhance forest health and habitat diversity. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife–cats, subsidized predators)*
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
1º	Conduct surveys to find more information about species and management requirements for secretive marsh nesting birds. *(Conserve wildlife – rare wildlife)*
1º	Research the habitat requirements for species of conservation concern and implement planned silviculture practices to enhance forests for these species. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
2º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*

Priority	Conservation Action (continued)
2º	Work with the Pinelands Commission to investigate terrestrial habitat requirements for the northern pine snake and develop a predictive model to identify pine snake habitat and habitat use at critical life stage sites (e.g., nesting areas) that require additional protection from collection, disturbance, and destruction. Such a model could be a fundamental tool used in the Pinelands Commission's evaluation of development applications. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Work with local agencies and stakeholders to develop and implement proactive habitat management/conservation plans for Pine Barrens treefrog. Such a plan should include ongoing surveys for this species to identify healthy populations and a scheme to protect habitats to connect populations and maintain viable metapopulations. *(Conserve wildlife – rare wildlife)*
2º	Work with public and private landowners and managers with significant grassland bird and scrub-shrub/open field bird populations, bald eagle, northern pine snake, Pine Barrens treefrog, cavity-nester, freshwater wetland bird, and raptor populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Enhance habitat – private lands; Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Determine carrying capacity of pinelands wetlands for breeding wood ducks, including available nest cavities and breeding season food resources. Use this data to develop appropriate management strategies (e.g., installation of wood duck boxes or habitat management to enhance and support targeted native invertebrate populations). *(Conserve wildlife – game species)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant elevated or listed status among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats for breeding, migratory, and wintering waterfowl and assess their condition for maintaining populations. Work with the DFW, Bureau of Wildlife Management to develop protection strategies to maintain and enhance existing waterfowl habitat. *(Protect habitat – game species)*

Priority	Conservation Action (continued)
Prevent illegal collection of rare reptiles and amphibians	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
2º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS-NWR officers, US Army Natural Resources Managers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry's park police to enforce protection of native wildlife from illegal collection (northern pine snakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with appropriate government agencies to survey for and monitor the spread of invasive insect species that jeopardize the health of Pinelands forest types (e.g., Atlantic white cedar, pitch-pine lowlands, oak-pine uplands, and others). *(Evaluate restoration – invasives)*
1º	Work with public and private landowners and managers and regulatory agencies to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*

Priority	Conservation Action (continued)
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	Work with the Division of Fish and Wildlife to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration. *(Conserve wildlife – deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer. *(Conserve wildlife – deer)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public awareness and conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Develop and encourage nature tourism opportunities in the Pinelands including wildlife viewing sites, interpretive signage highlighting unique ecosystems/habitats, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats. *(Education – humans)*

Priority	Conservation Action (continued)
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter, and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop educational programs, brochures and posters for the public regarding tolerance and protection of timber rattlesnakes and their habitat. *(Education - humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop educational brochures and posters describing habitat management practices that can be carried out on both private and pubic lands. These brochures and posters should focus on the management, enhancement, and creation of habitat for early successional species and include descriptions of various forestry management techniques; the primary and secondary benefits of prescribed burning should be highlighted. *(Education – humans; Conserve wildlife – rare wildlife)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect bald eagles, frosted elfins, cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub/open field bird nesting sites.
    - Utilize incentive programs that encourage the management of forests, grassland and scrub-shrub communities.
    - Through incentive programs, encourage private landowners surrounding public natural lands to manage land for large forest patches in order to increase effective size and connectivity of forests.
    - Encourage farmers to preserve farmland with conservation easements through partnerships with Green Acres, The Nature Conservancy, Trust for Public Lands, and

local municipalities for the conservation of forests, grassland and scrub-shrub communities.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
    - Develop/maintain cooperative relationships with Atlantic City Airport to encourage the management of grasslands for species of conservation concern.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions and harmful insect infestations. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - Work with landowners to maintain/enhance existing habitats where listed and special concern fish species occur.
    - In the context of landowner incentive programs such as LIP, Forestry Stewardship, etc., work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as the Pineland Preservation Alliance (PPA), NJ Audubon Society (NJAS), local land trusts, The Nature Conservancy – NJ Chapter (TNC), and NJ Conservation Foundation (NJCF) and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
    - Collaborate with PPA, NJAS, NJCF, TNC, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Involve Citizen Scientists in management and protection projects, such as protection and posting of bald eagle nesting areas.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species.
    - Continue volunteer-based summer bat concentration surveys.
- Collaborate with NJ Audubon Society to educate public on the effects of feral cats on wildlife species of conservation concern.
- Promote backyard habitat management for migratory raptors and passerines, and for vernal pools where appropriate.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with conservation organizations, Pinelands Preservation Alliance (PPA), The Nature Conservancy-NJ Chapter (TNC), NJ Audubon Society (NJAS), NJ Conservation Foundation (NJCF), and environmental, member-based organizations to protect and enhance habitats.
    - Work with TNC, NJAS, NJCF and environmental, member-based organizations to protect and enhance large tracts of contiguous forest, especially those adjacent to state (or otherwise permanently preserved) lands, beneficial to bald eagle, barred owl, cavity-nesters, and raptor nesting and foraging sites.
    - Work with PPA, TNC, NJAS and other environmental, member-based organizations to identify, manage, and protect bald eagle and raptor nesting and wintering areas.
    - Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants and invasive insects that can affect forest health.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Consult with conservation organizations to develop educational programs.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA's Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) - NJ Field Office, US Department of Defense (DOD), and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats and protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) to collaborate with the Pinelands Commission to identify and protect important habitat for wildlife. When appropriate, change the boundaries of Pinelands Management Areas to better manage development around sensitive areas.
    - Identify valuable habitats for preservation and work with the DEP's Green Acres Program to pursue acquisition of these areas.
    - DFW to lead in protecting sensitive bald eagle and northern pine snake sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bald eagle and timber rattlesnake sites.
    - Foster a relationship between the DFW and private/public landowners to restrict the use of off-road vehicles (ORVs) in critical wildlife habitats.
    - DFW and USFWS to work with New Jersey's Forest Fire Service and the DEP's Office of Natural Lands Management to develop a strategy for reintroducing fire ecology into the Pinelands ecosystem through the use of prescribed burns.
    - ENSP, Pinelands Commission, conservation organizations, and the DEP's Land Use Regulation Program to protect vernal pools and appropriately classify wetlands for spotted turtle and other vernal pool species.

  - Expand efforts to create habitat and implement best management practices for frosted elfin, northern pine snake, cavity-nesters, forest passerines, freshwater wetland birds, raptors, and scrub-shrub birds on state lands and with other natural resource managers, county and municipal utility authorities, utility companies, and planners.
  - Expand efforts to create habitat and implement best management practices for forest passerines and raptors, forest reptiles, and bald eagles on state lands and with other natural resource managers, county and municipal utility authorities and planners.
  - DFW to work with DEP's Division of Watershed Management and other DEP agencies to establish ecologically relevant buffers for riparian and floodplain areas for forest passerines.
  - DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan as appropriate.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to lead in the development of specific conservation plans for special concern reptiles and amphibians on state lands.
  - DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
  - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with state and county mosquito commissions to prevent the use of deleterious insecticides and biological controls at known amphibian breeding sites.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with DEP's Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to work with the USFWS and Department of Defense to develop effective plans to eradicate invasive non-indigenous plants that are threatening critical wildlife habitats on federal and state lands and aquatic systems.
- DFW to lead in the development of educational materials for public and private landowners about forest-dependent and grassland-dependent wildlife and their habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.

- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Monitor abundance, productivity, distribution, and trends of frosted elfin, bald eagle, northern pine snake, cavity-nester, colonial waterbird, forest passerine, freshwater wetland birds, grassland bird, raptor, and scrub-shrub/open field bird populations.
- Monitor contaminant levels that may impact bald eagle populations.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the volunteer coverboard surveys.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Work with volunteers, private landowners, and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

2. Western Pinelands

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

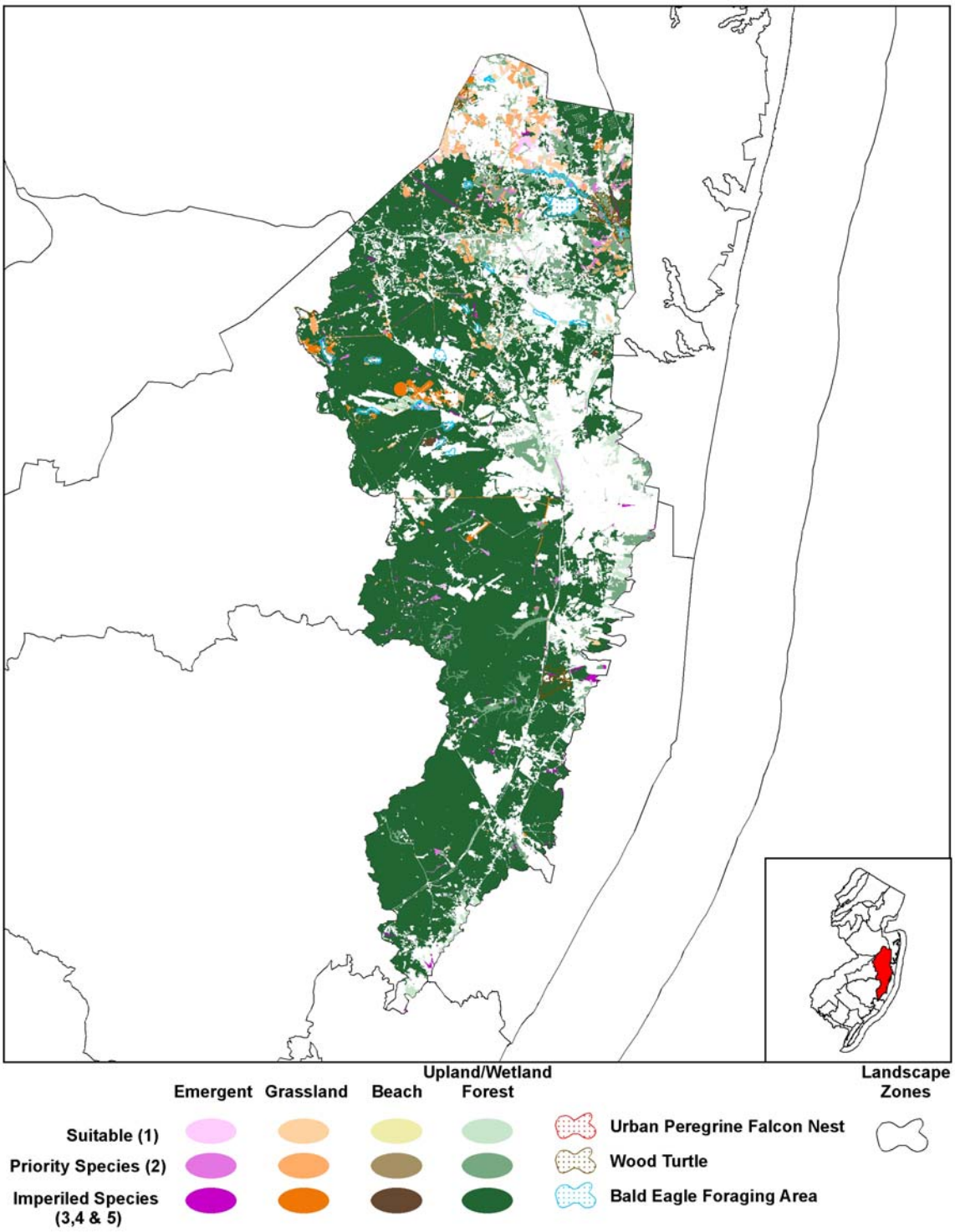
The Western Pinelands is the smallest of the four conservation zones in the Pinelands (Figure 24). Many of the characteristic pitch pine-oak forests, white cedar forested wetlands, marshes, sluggish acidic streams, and hardwood swamps of this zone are within the protected state lands of Greenwood Forest WMA and Brendan T. Byrne State Forest. Fort Dix Military Installation makes up roughly 15% of the total Pinelands Conservation Zone and contains habitat for many T&E wildlife species. This base is believed to support the nation's largest single population of the state-endangered arogos skipper (Lepidoptera). Because 84% of this zone falls within the Pinelands National Reserve, limited growth has occurred in large portions of the Western Pinelands.

b. Wildlife of Greatest Conservation Need

The Western Pinelands support one federal threatened, six state endangered, 10 state threatened, and 66 nongame species of conservation concern. The bog turtle is federal threatened; the bald eagle, red-shouldered hawk, vesper sparrow, timber rattlesnake, and arogos skipper are state endangered; and the barred owl, Cooper's hawk, red-headed woodpecker, northern pine snake, Pine Barrens treefrog, and silver-bordered fritillary are among the state threatened wildlife. Special concern wildlife include cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, scrub-shrub/open field birds, reptiles, amphibians, and butterflies. The northern bobwhite quail, wood duck, and Virginia rail are among seven regional priority game species that inhabit this zone. In addition, summer populations of forest-dwelling bat species occur in the Western Pinelands.

The pitch pine-oak forest provides habitat essential to northern pine snakes and timber rattlesnakes. The woodlands and wooded wetlands also support bald eagle, Pine Barrens treefrog, arogos skipper, and silver-bordered fritillary populations. These woodlands also provide nesting sites for cavity-nesters and habitat for forest passerines and raptors, forest-dwelling bats, coastal plain milk snake, eastern box turtle, eastern kingsnake, spotted turtle, carpenter frog, Fowler's toad, marbled salamander, and dotted skipper populations. A small, but stable, population of red-headed woodpecker inhabits the low-density forest stands on the New Lisbon Developmental Center and, sporadically, in Brendan T. Byrne State Forest and Greenwood WMA. Tables P16 – P22 identify the species of greatest conservation need within this zone.

Figure 24. Critical landscape habitats within the Western Pinelands conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Western Pinelands

Table P16. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana Bat				X**
Reptiles				
Bog turtle		X		

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
X: Species occurs within the identified habitat.

Table P17. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American Bittern		X		
Bald eagle		X	X	X
Red-shouldered hawk				X
Vesper sparrow			X	
Reptiles				
Timber rattlesnake			X	X
Insects				
Arogos skipper		X		

X: Species occurs within the identified habitat.

Table P18. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Northern pine snake			X	X
Amphibians				
Eastern mud salamander				X
Pine Barrens Treefrog		X		X
Insects				
Silver-bordered fritillary		X		X

X: Species occurs within the identified habitat.

Table P19. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern red bat				X*
Eastern small-footed myotis				X*
Hoary bat				X*
Marsh rice rat		X		
Silver-haired bat				X*
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Black-billed cuckoo				X
Black-throated green warbler				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Common Barn owl			X	
Common nighthawk				
Dickcissel			X	
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Great blue heron		X		
Great crested flycatcher			X	
Great egret		X		
Green heron		X		
Hooded warbler				X
Horned lark			X	
Indigo bunting			X	
Kentucky warbler				X
King rail		X		
Louisiana waterthrush				X
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Spotted sandpiper		X		
Tricolored heron		X		
Veery				X
Whip-poor-will		X	X	
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Reptiles				
Coastal plain milk snake				X
Eastern box turtle			X	X
Eastern kingsnake				X
Spotted turtle			X	X
Amphibians				
Carpenter frog				X
Fowler's toad		X	X	X
Insects				
A geometrid moth *Metarranthis sp 1*				X
A noctuid moth *Apharetra dentata*				X
A noctuid moth *Macrochilo sp 1*			X	
A spanworm *Itame sp 1*				X
Buchholz's gray *Hypomecis buchholzaria*				X
Carter's noctuid moth *Spartiniphaga carterae*			X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Insects (continued)				
Daecke's pyralid moth *Crambus daeckellus*			X	
Doll's merolonche *Merolonche dolli*				X
Dotted skipper *Hesperia attalus*			X	
Granitosa fern moth *Callopistria granitosa*				X
Pine Barrens bluet *Enallagma recurvatum*		X		
Pink streak *Faronta rubripennis*				X
Placentia tiger moth *Grammia placentia*			X	
Scarlet bluet *Enallagma pictum*		X	X	
Two-spotted skipper *Euphyes bimacula*		X		
Fish				
American brook lamprey**	X			
Banded sunfish**	X			
Black-banded sunfish	X			
Mud sunfish	X			

*Potential presence.
**Species are also recognized as target species of ecoregional concern by the Nature Conservancy – NJ Chapter.
X: Species occurs within the identified habitat.

Table P20. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck		X		
American woodcock			X	X
Canada goose (Atlantic population)	X	X		
Northern bobwhite			X	X
Virginia Rail		X		
Wood duck		X		X

X: Species occurs within the identified habitat.

Table P21. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Margined madtom	X
Pirate perch	X

X: Species occurs within the identified habitat.

Table P22. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Western Pinelands

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The Western Pinelands Conservation Zone has extensive forest tracts that support forest interior species, yet intense development in Evesham, Medford, and Southampton townships has fragmented many contiguous forests. Even within the boundaries of the Pinelands National Reserve, development has resulted in the destruction of critical habitat for state threatened and endangered species. With the increased traffic associated with development in these townships, roads have become a major threat to wildlife on the western fringe of this zone. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, maintain, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of forest and forested wetlands as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife including interior-forest raptors and passerines, northern pine snake, freshwater wetland birds, silver-bordered fritillary, rare reptiles and amphibians, and rare dragonflies, damselflies, butterflies, and moths.
- Identify, protect, maintain, enhance, and restore important early succession (areas comprised of <5% woody vegetation, with a mix of native grasses, forbes and bare soil) as identified by the Landscape Project for grassland birds and scrub-shrub/open field wildlife populations.
- Identify, protect, maintain, enhance, and restore critical aquatic ecosystems, riverine and riparian habitats, and water quality to preserve aquatic ecosystems particularly for species of conservation concern that rely on high water quality or low pH waters such as rare reptiles, amphibians, and native fish.
- Protect and restore characteristic Pinelands communities.
- Preserve the ecological quality and integrity of wetland habitats and vernal pool communities.

- Inventory, determine distribution, and monitor wildlife and nongame fish species of greatest conservation need in the Western Pinelands.
- Prevent, stabilize, and reverse declines of interior-forest raptors and passerines, northern pine snake, freshwater wetland birds, silver-bordered fritillary, rare reptiles and amphibians, and rare dragonflies, damselflies, moths and butterflies, grassland and scrub-shrub/open field wildlife populations, freshwater mussels, and native Pinelands fish species such as the blackbanded sunfish, banded sunfish, mud sunfish, and pirate perch.
- Prevent illegal collection of rare reptiles and amphibians (including bog turtles, northern pine snakes, and timber rattlesnake) and of Asiatic clams, which potentially damages native mussel populations through treading and disruption of habitat.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness and wildlife conservation.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Pinelands Regional Landscape stakeholders during a meeting held on June 13, 2007 (see *Attachment I*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Action
Protect critical habitats identified by the Landscape Project and critical aquatic habitats	
1°	Review existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat - Landscape Project)*
1°	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
1°	Use GIS measures, other remote sensing tools, and surveys to identify and assess critical core forests for forest-interior songbirds, forest raptors (red-shouldered hawk, barred owl), forest-dwelling bats, Pine snakes, timber rattlesnakes, and bald eagles. Take action to minimize habitat loss and maintain large core areas by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, forest management and stewardship plans. Maintain information in the Landscape Project and Biotics database, and provide this information to the Pinelands Commission. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*

Priority	Conservation Action (continued)
Protect critical forest and forested wetlands habitats identified in the Landscape Project	
1º	Manage forests on a regional scale to provide a mix of seral (successional) stages for a wide range of forest-dwelling species (e.g., woodland raptors, northern pine snakes, timber rattlesnakes, pine warbler, black-throated green warbler, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. These forest types include but are not limited to: mature and near-mature forests with large trees, > 80% canopy closure and an uneven-age structure; mature forests with 65-85% canopy closure and structural diversity; pine-oak savanna with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing healthy Pinelands forests. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and wildlife surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*
2º	Develop a species occurrence area of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). As GIS data layers become available, develop a predictable model of Indiana bat summer habitat. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
Protect critical early successional habitats identified in the Landscape Project	
1º	Research different techniques for maintaining suitable habitat for species dependent on early successional habitats (e.g., prescribed burning, mowing, brush-hogging, and other methods). *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing early succession habitats which will improve habitat quality for grassland- and scrub-shrub-dependent species. BMPs will be implemented on large grassland patches (areas with >75 % herbaceous and <25% woody vegetation) on public lands, and areas such as those at the Fort Dix Military Installation, and along some utility line rights-of-way (scrub-shrub). *(Protect habitat – humans; Conserve wildlife – rare wildlife; Agriculture – land management; Other practices – land management)*
2º	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed; this can be accomplished through public education and incentive programs. Continue to evaluate the effectiveness of delayed mowing for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. *(Protect habitat – humans; Enhance habitat –private lands)*
2º	Use GIS measures, other remote sensing tools, and wildlife surveys to identify grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for mowing, prescribed burning) strategies to maintain and enhance these habitats in perpetuity. Focus on habitat patches that can be managed at a size and scale that is similar to historic patch size of this habitat type as being researched by the Pinelands Commission as part of their "Right-of-way Project." *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height), assess their condition for nesting birds (golden-winged warbler and woodcock) and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create them. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*

Priority	Conservation Action (continued)
Protect critical riverine and riparian habitats identified in the Landscape Project	
2º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl), forest-interior songbirds, timber rattlesnakes, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Identify and protect habitat for fish by performing QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and plotting distributions of special concern fish species (as identified by the Delphi process), and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat - rare wildlife, fish)*
Protect and restore characteristic Pinelands communities	
1º	Restore the dynamic nature of this ecosystem by developing management plans for state lands which incorporate the needs of Pinelands plants and animals and generate the spatial patch diversity needed by species within this community. *(Conserve wildlife – rare wildlife)*
1º	Research different management techniques (e.g., ecologically-based forestry activities, prescribed burns) that might be used to mimic the historic role of fire and other natural disturbances in shaping this ecosystem. Implement appropriate management actions in areas where natural disturbances, such as wildfire, have been precluded. *(Conserve wildlife – rare wildlife)*
1º	Identify, enhance, and restore Atlantic white cedar communities within the Pinelands for timber rattlesnakes, black-throated green warblers, red-shouldered hawks, barred owls, and Cooper's hawks. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify rare and unique Pinelands plant communities and increase protection for these areas through acquisition, proper management, or increased enforcement. *(Protect habitat - Landscape Project)*

Priority	Conservation Action (continued)
2º	Work with the Division of Parks and Forestry including the Office of Natural Lands Management, the Forest Fire Service, and Forest Service to determine the historic and future role of fire in the creation and management of unique Pinelands communities. *(Conserve wildlife – rare wildlife)*
2º	Develop, implement, and evaluate best management practices (BMPs) for utility line rights-of-way that favor the establishment and persistence of native, early-successional Pinelands communities. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
Preserve the ecological quality and integrity of wetlands and vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool-dependent species. *(Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat – private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
2º	Maintain stream water chemistry/ water quality important for species native to the Pinelands by limiting developed land and upland agriculture to less than 10% of a watershed. For example, maintain low pH waters important for breeding populations of carpenter frogs. *(Conserve wildlife – rare wildlife; Protect habitat – rare wildlife)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.
1º	Conduct surveys and work with herpetologists to locate undocumented timber rattlesnake hibernacula and incorporate data into the Biotics database and Landscape Project. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
1º	Conduct searches for silver-bordered fritillary and dotted skipper in suitable habitat and incorporate data into the Biotics database and Landscape Project. Assess dotted skipper for conservation status. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
1º	Conduct surveys for dragonflies and damselflies in appropriate habitats throughout the Western Pinelands to determine species distributions and identify habitat protection needs. *(Enhance habitat - odonata)*

Priority	Conservation Action (continued)
1º	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. *(Protect habitat - mussels)*
1º	Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species. *(Protect habitat – Landscape Project)*
1º	Survey suitable habitats in SW Branch of Rancocas Creek and associated waterways to determine triangle floater distribution. *(Protect habitat - mussels)*
1º	Determine baseline abundance and establish long-term monitoring programs for wildlife of greatest conservation need (e.g., develop population estimates for rare Pinelands species and conduct range-wide surveys every four years). *(Monitor wildlife – long-term monitoring)*
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for endangered, threatened, and native Pinelands species. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills and common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Monitor wildlife – long-term monitoring)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by FishTrack Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife - fish)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Long-term sampling of forest dwelling bat species should be conducted to determine population trends and species response to changes in habitats. *(Monitor wildlife – long-term monitoring)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
2º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*

Priority	Conservation Action (continued)
2º	Conduct surveys for the eastern mud salamander at historic sites and evaluate its use of wetlands and wetland buffers. *(Conserve wildlife – rare wildlife)*
Prevent, stabilize, and reverse declines of rare wildlife, freshwater mussels, and native Pinelands fish species	
1º	Evaluate and assess the potential impacts of wind turbines to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on birds and bats. *(Protect habitat - humans)*
1º	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Division of Parks and Forestry to designate riding areas and BMPs should be developed. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*
1º	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g. wildlife underpasses, road closures). *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement proactive habitat conservation goals that will meet and maintain recovery needs of endangered and threatened wildlife and fish populations, particularly for those restricted to the Pinelands region. These include guidelines for forest silviculture on public and private lands to enhance forest health and habitat diversity. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands)*
1º	Investigate the impact of land-use patterns on Pine Barrens treefrogs. Develop and implement proactive habitat management/conservation plans for Pine Barrens treefrogs. Such a plan should include working with regulators to maintain water quality of breeding ponds (low pH) and protect suitable buffers on ponds, ongoing surveys for this species to identify healthy populations, and a scheme to protect habitats that connect populations and maintain viable metapopulations. *(Conserve wildlife – rare wildlife)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*

Priority	Conservation Action (continued)
1º	Research the effects of current prescribed burning practices on Pinelands dependent species and work with foresters to develop and implement effective forest management and stewardship plans to increase or maintain the habitat quality for these species in the Pinelands. *(Conserve wildlife – rare wildlife)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife–cats, subsidized predators)*
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
1º	Research the habitat requirements for species of conservation concern and implement planned silviculture practices to enhance forests for these species. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat – private lands)*
1º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*
2º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
2º	Work with the Pinelands Commission to investigate terrestrial habitat requirements for the northern pine snake and develop a predictive model to identify pine snake habitat and habitat use at critical life stage sites (e.g., nesting areas) that require additional protection from collection, disturbance, and destruction. Such a model could be a fundamental tool used in the Pinelands Commission's evaluation of development applications. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
2º	Work with public and private landowners and managers with significant grassland bird and scrub-shrub/open field bird populations, bald eagle, northern pine snake, Pine Barrens treefrog, cavity-nester, freshwater wetland bird, and raptor populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Enhance habitat – private lands; Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
2º	Determine carrying capacity of pinelands wetlands for breeding wood ducks, including available nest cavities and breeding season food resources. Use this data to develop appropriate management strategies (e.g., installation of wood duck boxes or habitat management to enhance and support targeted native invertebrate populations). *(Conserve wildlife – game species)*
2º	Manage silver-bordered fritillary habitat for proliferation of host vegetation and to retard succession where appropriate. *(Conserve wildlife – rare wildlife)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant elevated or listed status among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats for breeding, migratory, and wintering waterfowl and assess their condition for maintaining populations. Work with the DFW, Bureau of Wildlife Management to develop protection strategies to maintain and enhance existing waterfowl habitat. *(Protect habitat – game species)*
2º	Identify and implement best management practices for bald eagle, forest-interior passerine and raptor habitat, and migratory stopover areas. *(Conserve wildlife – rare wildlife)*
2º	Protect water quality and aquatic-dependent species such as listed freshwater mussels and rare fish species by appropriately designating Category 1 waters. *(Protect habitat - rare wildlife, fish)*
Prevent illegal collection of rare amphibians and reptiles, and Asiatic clams	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog turtles, timber rattlesnakes), persecution (timber rattlesnakes), and human disturbance (off-road vehicles, clam harvesting). *(Protect wildlife – humans, recreational vehicles)*

Priority	Conservation Action (continued)
2º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry's park police to enforce protection of native wildlife from illegal collection (including bog turtles, northern pine snakes), persecution (timber rattlesnakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with appropriate government agencies to survey for and monitor the spread of invasive insect species that jeopardize the health of Pinelands forest types (e.g., Atlantic white cedar, pitch-pine lowlands, oak-pine uplands, and others). *(Evaluate restoration – invasives)*
1º	Work with public and private landowners and managers and regulatory agencies to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. Control measures often cause soil disturbance that increases the chance of invasion by the same or other non-indigenous plants. *(Conserve wildlife - invasives)*
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*

Priority	Conservation Action (continued)
2º	Work with the Division of Fish and Wildlife to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration. *(Conserve wildlife – deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer. *(Conserve wildlife – deer)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public awareness and conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Develop and encourage nature tourism opportunities in the Pinelands including wildlife viewing sites, interpretive signage highlighting unique ecosystems/habitats, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter, and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop educational programs, brochures and posters for the public regarding tolerance and protection of timber rattlesnakes and their habitat. *(Education - humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*

Priority	Conservation Action (continued)
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop educational brochures and posters describing habitat management practices that can be carried out on both private and pubic lands. These brochures and posters should focus on the management, enhancement, and creation of habitat for early success ional species and include descriptions of various forestry management techniques; the primary and secondary benefits of prescribed burning should be highlighted. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education - humans)*
2º	Develop a field guide to New Jersey's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna. *(Education - humans)*

f. Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect bald eagle, red-headed woodpecker, cavity-nester, forest passerine, freshwater wetland bird, grassland bird, raptor, and scrub-shrub/open field bird nesting sites.
    - Utilize incentive programs that encourage the management of forests, grassland and scrub-shrub communities.
    - Through incentive programs, encourage private landowners surrounding public natural lands to manage land for large forest patches in order to increase effective size and connectivity of forests.
    - Utilize the Landowner Incentive Program to protect water quality and riparian habitat in areas where rare mussels occur.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
    - Encourage farmers to preserve farmland with conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of forests, grassland and scrub-shrub communities.
    - Work with landowners to maintain/enhance riparian areas through stream bank restoration and planting native vegetation.
    - Work with landowners to protect water quality by minimizing use of fertilizers and pesticides.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions and harmful insect infestations; and to develop effective control or eradication measures to protect critical wildlife habitats.

- Work with landowners to maintain/enhance existing habitats where listed and special concern fish species occur.
- As part of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups (Pineland Preservation Alliance (PPA), NJ Audubon Society (NJAS), local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation (NJCF)) and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with PPA, NJAS, NJCF, TNC, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Involve Citizen Scientists in management and protection projects, such as protection and posting of bald eagle nesting areas.
    - Continue volunteer-based summer bat concentration surveys.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species.
- Collaborate with NJAS to educate public on the effects of feral cats on wildlife species of conservation concern.
- Promote backyard habitat management for migratory raptors and passerines, and for vernal pools where appropriate.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Collaborate with the National Native Mussel Conservation Committee and other experts to develop best management practices for areas with listed and special concern species.
- Work with American Museum of Natural History to maintain existing NY/NJ freshwater mussel web site.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with conservation organizations such as the Pinelands Preservation Alliance (PPA), The Nature Conservancy-NJ Chapter (TNC), NJ Audubon Society (NJAS), and NJ Conservation Foundation (NJCF) and other environmental, member-based organizations to protect and enhance habitats.
    - Work with PPA, TNC, NJAS, NJCF and environmental, member-based organizations to protect and enhance large tracts of contiguous forest, especially those adjacent to

state lands, beneficial to bald eagles, barred owls, cavity-nesters, and raptor nesting and foraging sites.
    - Work with TNC, NJAS and other environmental, member-based organizations to manage and protect bald eagle and raptor nesting and wintering areas.
    - Work with PPA, TNC, NJAS, and other environmental, member-based organizations to protect and enhance sites hosting significant populations of rare dragonflies, damselflies, moths and butterflies on conservation lands.
    - Conduct habitat surveys to determine geographic distribution and severity of invasive non-indigenous plant and insect invasions that can affect forest health.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participating in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Consult with conservation organizations to develop educational programs.

<u>Local Government, Other State and Federal Agencies</u>

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA'a Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) - NJ Field Office, US Department of Defense (DOD), and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats; and protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) to collaborate with the Pinelands Commission to identify and protect important habitat for wildlife. When appropriate, change the boundaries of Pinelands Management Areas to better manage development around sensitive areas.
    - Identify valuable habitats for preservation and work with the DEP's Green Acres Program to pursue acquisition of these important areas.
    - DFW to work with the DEP's Division of Parks and Forestry (DPF) to create a management plan for Brendan T. Byrne State Forest.
    - DFW and USFWS to work with New Jersey's Forest Fire Service and the DEP's Office of Natural Lands Management to develop a strategy for introducing fire ecology back into the Pinelands ecosystem through the use of prescribed burns.
    - DFW to work with local law enforcement officers to develop a plan to protect sensitive bald eagle and pine snake sites from disturbance and timber rattlesnake and northern pine snake breeding sites from illegal collection.
    - DFW will lead in the prevention of the illegal harvesting of Asian clams, which potentially damages native mussel populations through treading and disruption of habitat.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bald eagle sites.
    - DFW to work with neighboring state fish and wildlife agencies to radio-track Indiana bats that disperse across state boundaries.

- DFW to work with the Pinelands Commission to protect sensitive areas around timber rattlesnake hibernacula.
- ENSP, conservation organizations, DEP's Land Use Regulation Program, and the Pinelands Commission to work together to protect vernal pools and appropriately classify wetlands for spotted turtle and special concern amphibian populations.
- Foster a relationship between the DFW and private/public landowners to restrict the use of off-road vehicles (ORVs) in critical wildlife habitats.
- Expand efforts to create habitat and implement best management practices for northern pine snake, cavity-nester, forest passerines, freshwater wetland birds, raptors, and scrub-shrub birds on state lands with NJDFW and NJDPF, and with natural resource managers, county and municipal utility authorities and planners.
- DFW to encourage ecologically relevant buffers for important riparian and floodplain areas for forest passerines, amphibians and reptiles, freshwater mussels, and invertebrates with the Pinelands Commission, and the DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels.
- DFW to work with the DEP's Division of Watershed Management, the DEP's Bureau of Water Monitoring and Standards, and the Pinelands Commission to recommend stream classification upgrades in stream segments where listed mussel species occur.
- DFW to work with federal military bases to develop habitat management plans to maintain arogos skipper habitats by impeding succession with controlled burns and scheduled mowing.
- DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan as appropriate.
- DFW to lead in the development of specific conservation plans for special concern reptiles and amphibians on state lands.
- DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
- DFW and USDA-NRCS to collaborate with SADC and NJ Farm Bureau to implement deer management plans on farmland, particularly in high deer-density areas.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with state and county mosquito commissions to prevent the use of deleterious insecticides and biological controls at known amphibian breeding sites.
- DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.

  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with DEP's Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to work with the USFWS and Department of Defense to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and aquatic systems that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW to lead in the development of educational materials for public and private landowners about forest-dependent and grassland-dependent wildlife and their habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by federal, state, and local planning agencies.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Monitor abundance, productivity, distribution, and trends of bald eagle, red-headed woodpecker, timber rattlesnake, cavity-nester, colonial waterbird, forest passerine, freshwater wetland birds, grassland bird, raptor, and scrub-shrub/open field bird populations.
- Monitor contaminant levels that may impact bald eagle populations.
- Monitor population trends, breeding success, and habitat of timber rattlesnake and northern pine snake.
- Routinely monitor the population trends of special concern reptiles and special concern amphibians.
- Conduct surveys for listed and special concern freshwater mussel species every four years to monitor populations.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

3. Mullica River Watershed

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

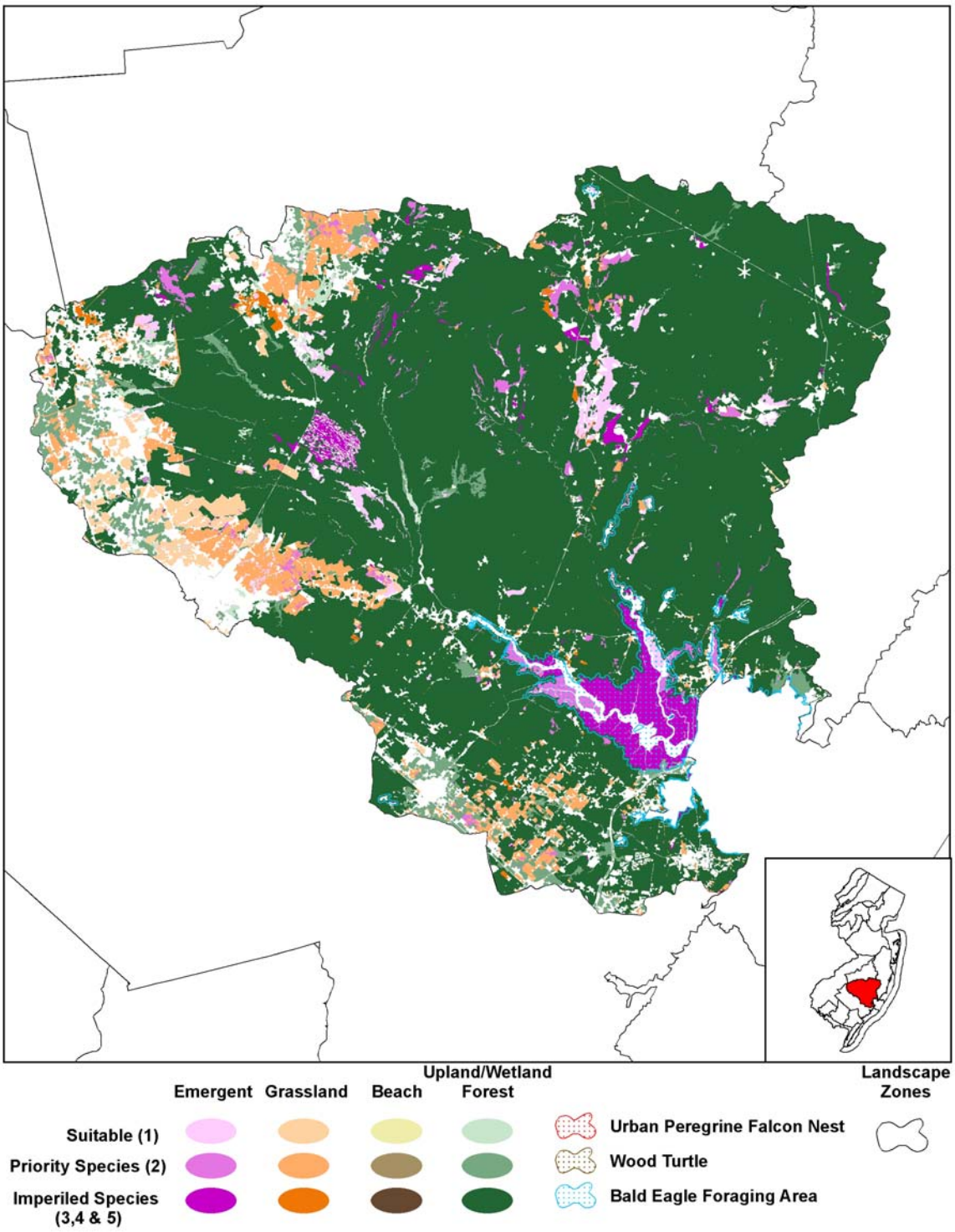
The Mullica River Watershed is the most pristine conservation zone in the Pinelands landscape region (Figure 25). This zone is almost completely within Pinelands National Reserve (98%) and over half of it is contained within the Preservation Management Area of the Pinelands. As a result, many of the pine-oak forests and Atlantic white cedar swamps in the Mullica River Watershed exist as large contiguous tracts. Only 6% of this zone is classified as "urban" based on the NJ DEP's 95/97 Land-use, Land-cover (LULC) data. Tidal marshes occur along the eastern fringe of this zone at the mouth of the Mullica River. Penn State Forest and the Bass River State Forest are conservation areas of opportunity in the Mullica River Watershed.

b. Wildlife of Greatest Conservation Need

The Mullica River Watershed supports six state endangered, seven state threatened, and 78 nongame species of conservation concern. The state endangered species in this zone are the bald eagle, the foraging black skimmer, red-shouldered hawk, corn snake, timber rattlesnake, and arogos skipper. Barred owl, black-crowned night-heron, Cooper's hawk, red-headed woodpecker, northern pine snake, osprey, and Pine Barrens treefrog are state threatened species. Special concern wildlife include forest passerines, raptors, scrub-shrub/open field birds, reptiles, and amphibians. Regional priority game species in this zone include the American black duck, northern bobwhite quail, and Virginia rail. In addition, summer populations of forest-dwelling bat species occur in the Mullica River Watershed.

The pitch pine-oak forests are home to bald eagle, red-headed woodpecker, forest-dwelling bats, corn snake, northern pine snake, timber rattlesnake, wood turtle, and Pine Barrens treefrog populations; and cavity-nester, colonial waterbird, forest passerine, raptor, and shrub-scrub/open field bird communities. Wetlands and open water along the Mullica River are habitat for foraging osprey, bald eagles, black skimmers, colonial waterbirds, northern diamondback terrapins, and special concern amphibians. Certain species of amphibians, such as carpenter frogs and Pine Barren treefrogs, have adapted to the acidity of the Pinelands cedar water. Tables P23 – P29 identify the species of greatest conservation need within this zone.

Figure 25. Critical landscape habitats within the Mullica River Watershed conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Mullica River Watershed

Table P23. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana Bat				X**

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
X: Species occurs within the identified habitat.

Table P24. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Bald eagle		X	X	X
Black skimmer		X		
Red-shouldered hawk				X
Reptiles				
Corn snake				X
Timber rattlesnake				X
Insects				
Arogos skipper		X	X	

X: Species occurs within the identified habitat.

Table P25. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night heron		X		
Cooper's hawk				X
Osprey		X		
Red-headed woodpecker				X
Reptiles				
Northern pine snake			X	X
Wood turtle				X
Amphibians				
Eastern mud salamander				X
Pine Barrens Treefrog			X	X

X: Species occurs within the identified habitat.

Table P26. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern red bat				X*
Eastern small-footed myotis				
Hoary bat				X*
Marsh rice rat		X		
Silver-haired bat				X*
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blue-winged warbler				X
Broad-winged hawk				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Brown thrasher				X
Common Barn owl			X	
Common nighthawk				
Dickcissel			X	
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Great blue heron		X		
Great crested flycatcher			X	
Great egret		X		
Green heron		X		
Hooded warbler				X
Indigo bunting			X	
Kentucky warbler				X
King rail		X		
Least flycatcher				X
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Rose-breasted grosbeak				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Snowy egret		X		
Spotted sandpiper		X		
Tricolored heron		X		
Veery				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Coastal plain milk snake				X
Eastern box turtle			X	X
Eastern kingsnake				X
Northern diamondback terrapin		X		
Spotted turtle			X	X
Amphibians				
Carpenter frog				X
Fowler's toad		X	X	X
Marbled salamander				X
Insects				
A geometrid moth *Idaea violacearia*				X
A noctuid moth *Apharetra dentata*				X
A noctuid moth *Macrochilo louisiana*			X	

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Insects (continued)				
A noctuid moth *Meropleon cosmion*		X		
A spanworm *Itame sp 1*				X
Buchholz's gray *Hypomecis buchholzaria*				X
Carter's noctuid moth *Spartiniphaga carterae*			X	
Chain fern borer moth *Papaipema stenocelis*				X
Doll's merolonche *Merolonche dolli*				X
Dotted skipper *Hesperia attalus*			X	
Granitosa fern moth *Callopistria granitosa*				X
Hessel's hairstreak *Callophrys hesseli*				X
Lemmer's pinion moth *Lithophane lemmeri*				X
Pine Barrens bluet *Enallagma recurvatum*		X		
Pine Barrens zale *Zale sp 1*				X
Pitcher plant borer moth *Papaipema appassionata*		X		
Placentia tiger moth *Grammia placentia*			X	
Rare skipper *Problema bulenta*				X
Scarlet bluet *Enallagma pictum*		X	X	
Southern ptichodis *Ptichodis bistrigata*			X	
The consort, or consors underwing *Catocala consors sorsconi*				X
Two-spotted skipper *Euphyes bimacula*		X		
Fish				
Banded sunfish**	X			
Black-banded sunfish	X			
Mud sunfish	X			

*Potential presence.
**Species are also recognized as target species of ecoregional concern by the Nature Conservancy – NJ Chapter.
X: Species occurs within the identified habitat.

Table P27. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck		X		
American woodcock			X	X
Canada goose (Atlantic population)	X	X		
Northern bobwhite			X	X
Virginia rail		X		
Wood duck		X		X

X: Species occurs within the identified habitat.

Table P28. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Pirate perch	X

X: Species occurs within the identified habitat.

Table P29. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Mullica River Watershed

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Habitat-specialists in the Mullica River Watershed are vulnerable to any upland development and habitat fragmentation by roads. Development and upland agriculture in the northwestern portion of this zone contribute to water quality degradation; pH increases and mounting demands on the Pinelands groundwater supply can lead to the loss of wetland habitats. Contaminants continue to plague bald eagles. Finally, disturbance and encroachment from recreational activities threaten sensitive wildlife in the Pinelands. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, maintain, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of forest and forested wetlands as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife including interior-forest raptors and passerines, corn snake, northern pine snake, timber rattlesnake, freshwater wetland birds, rare reptiles and amphibians, and rare dragonflies, damselflies, butterflies, and moths.
- Identify, protect, maintain, enhance, and restore important early succession (areas comprised of <5% woody vegetation, with a mix of native grasses, forbes and bare soil) as identified by the Landscape Project for grassland birds and scrub-shrub/open field wildlife populations.
- Identify, protect, maintain, enhance, and restore critical aquatic ecosystems, riverine and riparian habitats, and water quality to preserve aquatic ecosystems particularly for species

of conservation concern that rely on high water quality or low pH waters such as rare amphibians, and native fish.

- Protect and restore characteristic Pinelands communities.
- Preserve the ecological quality and integrity of wetland habitats and vernal pool communities.
- Inventory, determine distribution, and monitor wildlife and nongame fish species of greatest conservation need in the Mullica River Watershed.
- Prevent, stabilize, and reverse declines of interior-forest raptors and passerines, and stabilize populations of corn snake, northern pine snake, timber rattlesnake, freshwater wetland birds, rare reptiles and amphibians, rare dragonflies, damselflies, moths and butterflies, grassland and scrub-shrub/open field wildlife populations, and native Pinelands fish species such as the blackbanded sunfish, banded sunfish, mud sunfish, and pirate perch.
- Prevent illegal collection of rare reptiles and amphibians.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness and wildlife conservation.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Pinelands Regional Landscape stakeholders during a meeting held on June 13, 2007 (see *Attachment I*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Action
Protect critical habitats identified by the Landscape Project and critical aquatic habitats	
1º	Review existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat - Landscape Project)*
1º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*

Priority	Conservation Action (continued)
Protect critical forest and forested wetlands habitats identified in the Landscape Project	
1º	Manage forests on a regional scale to provide a mix of seral (successional) stages for a wide range of forest-dwelling species (e.g., woodland raptors, northern pine snakes, corn snakes, timber rattlesnakes, pine warbler, black-throated green warbler, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. These forest types include but are not limited to: mature and near-mature forests with large trees, > 80% canopy closure and an uneven-age structure; mature forests with 65-85% canopy closure and structural diversity; pine-oak savanna with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess critical core forests for forest-interior songbirds, forest raptors (e.g., barred owl), forest-dwelling bats, corn snakes, Pine snakes, timber rattlesnakes, and bald eagles. Take action to minimize habitat loss and maintain large core areas by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, forest management and stewardship plans. Maintain information in the Landscape Project and Biotics database, and provide this information to the Pinelands Commission. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing healthy Pinelands forests. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and wildlife surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*

Priority	Conservation Action (continued)
2º	Develop a species occurrence area of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). As GIS data layers become available, develop a predictable model of Indiana bat summer habitat. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
Protect critical early successional habitats identified in the Landscape Project	
1º	Research different techniques for maintaining suitable habitat for species dependent on early successional habitats (e.g., prescribed burning, mowing, brush-hogging, and other methods). *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing early succession habitats which will improve habitat quality for grassland- and scrub-shrub-dependent species. BMPs will be implemented on large grassland patches (areas with >75 % herbaceous and <25% woody vegetation) on public lands and along utility line rights-of-way (scrub-shrub). *(Protect habitat – humans; Conserve wildlife – rare wildlife; Agriculture – land management; Other practices – land management)*
2º	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed; this can be accomplished through public education and incentive programs. Continue to evaluate the effectiveness of delayed mowing for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. *(Protect habitat – humans; Enhance habitat –private lands)*
2º	Use GIS measures, other remote sensing tools, and wildlife surveys to identify grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for mowing, prescribed burning) strategies to maintain and enhance these habitats in perpetuity. Focus on habitat patches that can be managed at a size and scale that is similar to historic patch size of this habitat type as being researched by the Pinelands Commission as part of their "Right-of-way Project." *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height), assess their condition for nesting birds (golden-winged warbler and woodcock) and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create them. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*

Priority	Conservation Action (continued)
Protect critical riverine and riparian habitats identified in the Landscape Project	
2º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl), forest-interior songbirds, timber rattlesnakes, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Identify and protect habitat for fish by performing QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and plotting distributions of special concern fish species (as identified by the Delphi process), and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat - rare wildlife, fish)*
Protect and restore characteristic Pinelands communities	
1º	Restore the dynamic nature of this ecosystem by developing management plans for state lands which incorporate the needs of Pinelands plants and animals and generate the spatial patch diversity needed by species within this community. *(Conserve wildlife – rare wildlife)*
1º	Research different management techniques (e.g., ecologically-based forestry activities, prescribed burns) that might be used to mimic the historic role of fire and other natural disturbances in shaping this ecosystem. Implement appropriate management actions in areas where natural disturbances, such as wildfire, have been precluded. *(Conserve wildlife – rare wildlife)*
1º	Identify, enhance, and restore Atlantic white cedar communities within the Pinelands for timber rattlesnakes, red-shouldered hawks, barred owls, and Cooper's hawks. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify rare and unique Pinelands plant communities and increase protection for these areas through acquisition, proper management, or increased enforcement. *(Protect habitat - Landscape Project)*

Priority	Conservation Action (continued)
2º	Work with the Division of Parks and Forestry including the Office of Natural Lands Management, the Forest Fire Service, and Forest Service to determine the historic and future role of fire in the creation and management of unique Pinelands communities. *(Conserve wildlife – rare wildlife)*
2º	Develop, implement, and evaluate best management practices (BMPs) for utility line rights-of-way that favor the establishment and persistence of native, early-successional Pinelands communities. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
Preserve the ecological quality and integrity of wetlands and vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool-dependent species. *(Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat – private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
2º	Maintain stream water chemistry/ water quality important for species native to the Pinelands by limiting developed land and upland agriculture to less than 10% of a watershed. For example, maintain low pH waters important for breeding populations of carpenter frogs. *(Conserve wildlife – rare wildlife; (Protect habitat – rare wildlife)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas. *(Protect habitat - Landscape Project)*
1º	Survey suitable habitats to identify unidentified populations of arogos skipper. Develop a management plan to maintain and enhance habitat for arogos skipper using controlled burns. *(Protect habitat - Landscape Project)*
1º	Conduct surveys and work with herpetologists to locate undocumented hibernacula of corn snakes, northern pine snakes, and timber rattlesnakes, and incorporate data into the Biotics database and Landscape Project. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
1º	Conduct surveys for dragonflies and damselflies in appropriate habitats throughout the Mullica River Watershed to determine species distributions and identify habitat protection needs. *(Enhance habitat - odonata)*

Priority	Conservation Action (continued)
1º	Determine baseline abundance and establish long-term monitoring programs for wildlife of greatest conservation need (e.g., develop population estimates for rare Pineland species and conduct range-wide surveys every four years). *(Monitor wildlife – long-term monitoring)*
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for endangered, threatened, and native Pinelands species. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Develop and conduct nighttime surveys to inventory nightjars (common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Monitor wildlife – long-term monitoring)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by FishTrack Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Long-term sampling of forest dwelling bat species should be conducted to determine population trends and species response to changes in habitats. *(Monitor wildlife – long-term monitoring)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
2º	Conduct telemetry studies during summer months to determine roost characteristics and habitat requirements for maternity colonies. *(Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and develop a model of suitable northern diamondback terrapin nesting areas. *(Protect habitat - Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify northern diamondback terrapin key crossing areas and work with local or state transportation agencies to erect turtle barriers. *(Protect habitat – roads)*

Priority	Conservation Action (continued)
2º	Research population distribution of northern diamondback terrapin to determine critical areas for protection. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of rare wildlife, freshwater mussels, and native Pinelands fish species	
1º	Evaluate and assess the potential impacts of wind turbines to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on birds and bats. (*Protect habitat - humans*)
1º	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Division of Parks and Forestry to designate riding areas and BMPs should be developed. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*
1º	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g. wildlife underpasses, road closures). *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitat, including effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, impacts of roads, competition by invasive plants and animals, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement proactive species recovery plans for all endangered and threatened species within this zone. Develop and implement proactive habitat conservation plans that will help meet and maintain recovery goals, particularly for forest-interior species and bald eagles. *(Conserve wildlife – rare wildlife)*
1º	Investigate the impact of land-use patterns on Pine Barrens treefrog. Develop and implement proactive habitat management/conservation plans for Pine Barrens treefrogs. Such a plan should include working with regulators to maintain water quality of breeding ponds (low pH) and protect suitable buffers on ponds, ongoing surveys for this species to identify healthy populations, and a scheme to protect habitats that connect populations and maintain viable metapopulations. *(Conserve wildlife – rare wildlife)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat - fish)*
1º	Research the effects of current prescribed burning practices on Pinelands dependent species and work with foresters to develop and implement effective forest management and stewardship plans to increase or maintain the habitat quality for these species in the Pinelands. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife–cats, subsidized predators)*
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
1º	Conduct surveys to find more information about species and management requirements for secretive marsh nesting birds. *(Conserve wildlife – rare wildlife)*
1º	Research the habitat requirements for species of conservation concern and implement planned silviculture practices to enhance forests for these species. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
2º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
2º	Investigate terrestrial habitat requirements for the northern pine snake, and developed a predictive model to identify pine snake habitat. Such a model should be developed with input from the Pinelands Commission so that it can be a fundamental tool used in their evaluation of development applications. The model will potentially identify critical life-stage sites (e.g., nesting areas) that require additional protection from collection, disturbance, and destruction. *(Protect habitat - Landscape Project)*
2º	Develop management guidelines for private landowners with significant bald eagle, northern pine snake, Pine Barrens treefrog, cavity-nester, freshwater wetland bird, and raptor populations. *(Silviculture – land management)*
2º	Develop an Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Determine carrying capacity of pinelands wetlands for breeding wood ducks, including available nest cavities and breeding season food resources. Use this data to develop appropriate management strategies (e.g., installation of wood duck boxes or habitat management to enhance and support targeted native invertebrate populations). *(Conserve wildlife – game species)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant elevated or listed status among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
2º	Identify critical habitats and assess their condition for breeding, migratory and wintering waterfowl. Identify protection strategies to maintain existing waterfowl habitat. *(Protect habitat – game species)*
2º	Identify and implement best management practices for bald eagle, forest-interior passerine and raptor habitat, and migratory stopover areas. *(Conserve wildlife – rare wildlife)*
Prevent illegal collection of rare reptiles and amphibians	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens), particularly those used by corn snakes, northern pine snakes, and timber rattlesnakes, to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes, and Pine Barrens treefrog) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
2º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, US Army Natural Resources Managers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry's park police to enforce protection of native wildlife from illegal collection (including corn and northern pine snakes, timber rattlesnakes, and Pine Barrens treefrogs), persecution (timber rattlesnakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with appropriate government agencies to survey for and monitor the spread of invasive insect species that jeopardize the health of Pinelands forest types (e.g., Atlantic white cedar, pitch-pine lowlands, oak-pine uplands, and others). *(Evaluate restoration – invasives)*

Priority	Conservation Action (continued)
1º	Work with public and private landowners and managers and regulatory agencies to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened or priority wildlife species and are being threatened by invasive non-indigenous plants. Control measures often cause soil disturbance that increases the chance of invasion by the same or other non-indigenous plants. *(Conserve wildlife - invasives)*
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	Work with the Division of Fish and Wildlife to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration. *(Conserve wildlife – deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer. *(Conserve wildlife – deer)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public awareness and conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

Priority	Conservation Action (continued)
1º	Develop and encourage nature tourism opportunities in the Pinelands including wildlife viewing sites, interpretive signage highlighting unique ecosystems/habitats, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter, and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop educational programs, brochures and posters for the public regarding tolerance and protection of timber rattlesnakes and their habitat. *(Education - humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop educational brochures and posters describing habitat management practices that can be carried out on both private and pubic lands. These brochures and posters should focus on the management, enhancement, and creation of habitat for early success ional species and include descriptions of various forestry management techniques; the primary and secondary benefits of prescribed burning should be highlighted. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education - humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect bald eagle, arogos skipper, and rare snake habitat and cavity-nester, forest passerine, freshwater wetland bird, grassland bird, raptor, and scrub-shrub/open field bird nesting sites.

- Utilize incentive programs that encourage the management of forests, grassland and scrub-shrub communities.
- Through incentive programs, encourage private landowners surrounding public natural lands to manage land for large forest patches in order to increase effective size and connectivity of forests.
- Encourage farmers to preserve farmland with conservation easements through partnerships with DEP Green Acres Program, the Nature Conservancy, Trust for Public Lands, and local municipalities for the conservation of forests, grassland and scrub-shrub communities.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
- Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions and harmful insect infestations. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
- Work with landowners to maintain/enhance existing habitats where listed and special concern fish species occur.
- As part of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups (Pineland Preservation Alliance (PPA), New Jersey Audubon Society (NJAS), local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation (NJCF)) and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with PPA, NJAS, NJCF, TNC, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Involve Citizen Scientists in management and protection projects, such as protection and posting of bald eagle nesting areas.
    - Continue volunteer-based summer bat concentration surveys.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species.
- Collaborate with NJ Audubon Society to educate public on the effects of feral cats on wildlife species of conservation concern.
- Promote backyard habitat management for migratory raptors and passerines, and for vernal pools where appropriate.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.

- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with conservation organizations such as the Pinelands Preservation Alliance (PPA), The Nature Conservancy-NJ Chapter (TNC), NJ Audubon Society (NJAS), NJ Conservation Foundation (NJCF), and other environmental, member-based organizations to protect and enhance habitats.
    - Work with TNC, NJAS, NJCF and environmental, member-based organizations to protect and enhance large tracts of contiguous forest, especially those adjacent to state lands, beneficial to bald eagle, barred owl, cavity-nesters, and raptor nesting and foraging sites.
    - Work with PPA, TNC, NJAS and other environmental, member-based organizations to manage and protect bald eagle and raptor nesting and wintering areas.
    - Protect and enhance sites hosting significant populations of rare dragonflies, damselflies, moths, and butterflies on conservation lands.
    - Conduct habitat surveys to determine geographic distribution and severity of invasive non-indigenous plant and insect invasions that can affect forest health.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Consult with conservation organizations to develop educational programs.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA's Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) - NJ Field Office, US Department of Defense (DOD), and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) to collaborate with the Pinelands Commission to identify and protect important wildlife habitat. When appropriate, change the boundaries of Pinelands Management Areas to better manage development around sensitive areas.
    - Identify valuable habitats for preservation and work with the DEP's Green Acres Program to pursue acquisition of these important areas.
    - DFW and USFWS to work with New Jersey's Forest Fire Service and the DEP's Office of Natural Lands Management to develop a strategy for introducing fire ecology back into the Pinelands ecosystem through the use of prescribed burns.
    - DFW to lead in the protection of bald eagle, barred owl, cavity-nester, and raptor nesting and foraging sites.

- DFW to work with the local law enforcement officers to protect sensitive corn snake, timber rattlesnake, and northern pine snake sites from disturbance and collection.
- Foster a relationship between the DFW and private/public landowners to restrict the use of off-road vehicles in critical wildlife habitats.
- ENSP, conservation organizations, DEP's Land Use Regulation Program, and the Pinelands Commission to work together to protect vernal pools and critical habitats for corn snakes, timber rattlesnakes and northern pine snakes.
- DFW to share site information and expertise with state and federal law enforcement to increase surveillance of corn snake, timber rattlesnake, and northern pine snake sites.
- DFW to work with neighboring state fish and wildlife agencies to radio-track Indiana bats dispersing across state boundaries.
- DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan as appropriate.
- Expand efforts to create habitat and implement best management practices for frosted elfins, northern pine snakes, cavity-nesters, forest passerines, freshwater wetland birds, raptors, and scrub-shrub birds on state lands and with other natural resource managers, county and municipal utility authorities, utility companies, and planners.
- DFW will take lead on developing specific conservation plans for special concern reptiles and amphibians on state lands.
- DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with state and county mosquito commissions to prevent the use of deleterious insecticides and biological controls at known amphibian breeding sites.
- DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
- DFW to work with the Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to work with the USFWS and Department of Defense to develop effective plans to eradicate invasive non-indigenous plants that are threatening critical wildlife habitats on federal and state lands and aquatic systems.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.

  - Continue protection measures for northern diamondback terrapin with the Bureau of Law Enforcement by requiring excluders on commercial crab traps in small creeks and lagoons.
- DFW to lead in the development of educational materials for public and private landowners about forest-dependent and grassland-dependent wildlife and their habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Monitor abundance, productivity, distribution, and trends of bald eagle, corn snake, timber rattlesnake, northern pine snake, Pine Barrens treefrog, cavity-nester, colonial waterbird, forest passerine, and scrub-shrub/open field bird populations.
- Monitor contaminant levels that may impact bald eagle populations.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the volunteer coverboard surveys.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Work with volunteers, private landowners, and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

4. Northern Pinelands

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

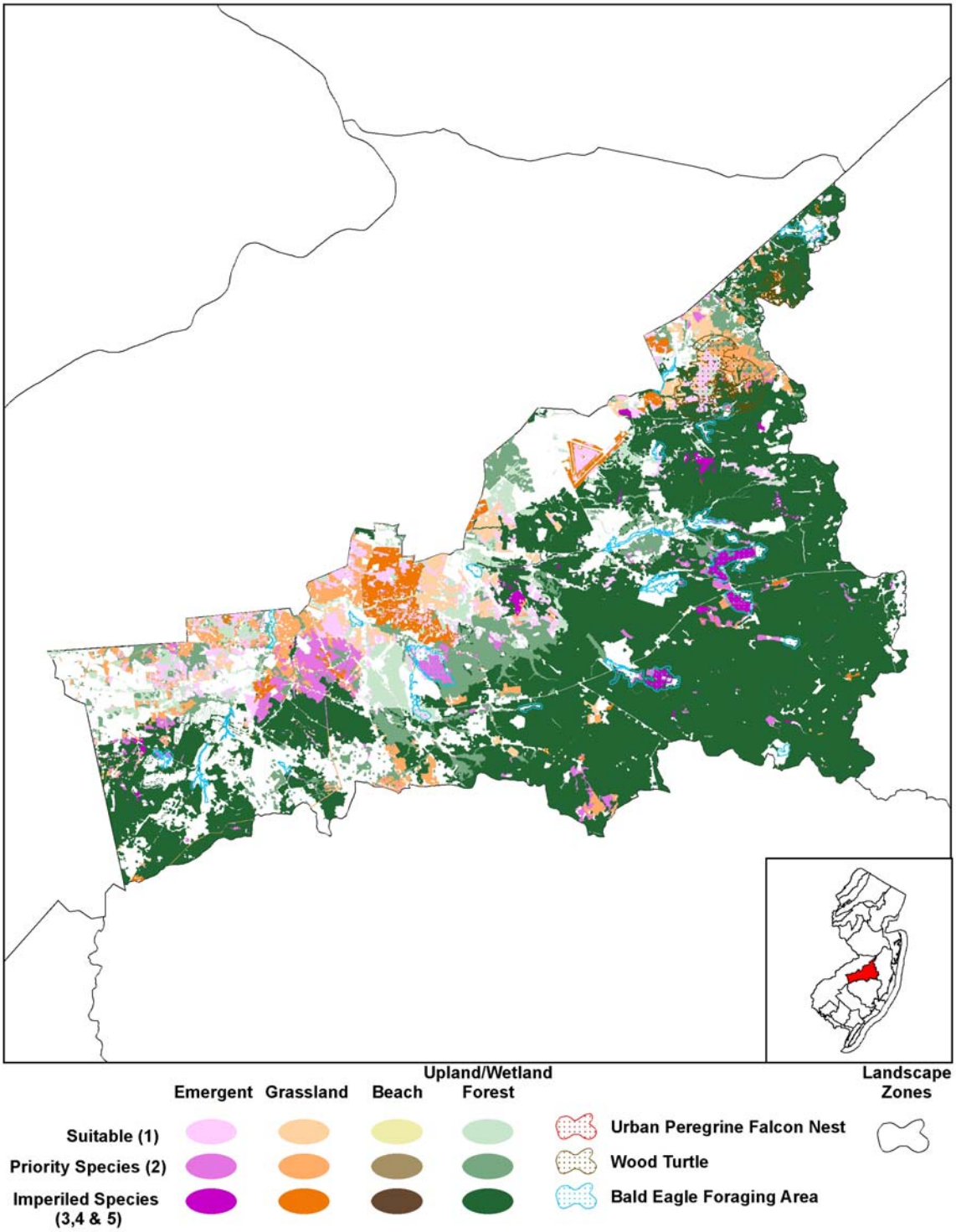
The dominant forest type of the Northern Pinelands Conservation Zone is coniferous pine-forest, with mixed pine-oak and deciduous forest somewhat less common (Figure 26). Deciduous forested wetlands are roughly twice as common as the Atlantic white cedar or coniferous-forested wetlands. Emergent wetlands are abundant along this zone's eastern edge. as forests begin to transition into coastal marshes. Within the Pinelands landscape region, the Northern Pinelands contain the highest percentage of developed land, with 24% of the total area of this zone classified as "urban" according to NJ DEP's 95/97 Land-use, Land-cover (LULC) data. Conservation areas of opportunity include Collier's Mills WMA, Greenwood WMA, Double Trouble State Park and Lakehurst Naval Station. Only 57% percent of this zone is contained within the Pinelands National Reserve.

b. Wildlife of Greatest Conservation Need

Within the Pinelands region, this zone harbors the highest number of listed species. One federal threatened, ten state endangered, and ten state threatened species, 73 nongame species of conservation concern, and seven regional priority game species occur in the Northern Pinelands. The bog turtle is the federal threatened wildlife. The bald eagle, red-shouldered hawk, upland sandpiper, vesper sparrow, corn snake, timber rattlesnake, barred owl, black-crowned night-heron, Cooper's hawk, grasshopper sparrow, and Pine Barrens treefrog are some of the state endangered and threatened species. Wildlife species of conservation concern include forest passerines, grassland birds, raptors, scrub-shrub/open field birds, reptiles, and amphibians. In addition, summer populations of forest-dwelling bat species are suspected to occur in the Northern Pinelands.

Agricultural lands are limited in this zone, but grasslands on the Lakehurst Naval Station provide some of the best grassland habitats found anywhere in the state and contain New Jersey's largest known breeding population of upland sandpipers. The field sparrow, grasshopper sparrow, savannah sparrow, vesper sparrow, and northern pine snake also use this site. The diverse habitats of the Northern Pinelands provide cover and food for forest passerines, raptors, scrub-shrub/open field birds, and bald eagle, coastal plain milk snake, corn snake, eastern box turtle, eastern kingsnake, northern pine snake, spotted turtle, timber rattlesnake, carpenter frog, Fowler's toad, marbled salamander, and Pine Barrens treefrog populations. Tables P30 – P36 identify the species of greatest conservation need within this zone.

Figure 26. Critical landscape habitats within the Northern Pinelands conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Northern Pinelands

Table P30. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana Bat				X**
Reptiles				
Bog turtle		X		

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
** Potential presence.
X: Species occurs within the identified habitat.

Table P31. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat				X
Birds				
Bald eagle		X	X	X
Black skimmer		X		
Least tern		X		
Red-shouldered hawk				X
Upland sandpiper			X	
Vesper sparrow			X	
Reptiles				
Corn snake				X
Timber rattlesnake				X
Amphibians				
Cope's gray treefrog		X		X

X: Species occurs within the identified habitat.

Table P32. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night heron		X		
Cooper's hawk				X
Grasshopper sparrow			X	
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Northern pine snake			X	X
Wood turtle			X	X
Amphibians				
Pine Barrens Treefrog		X		X

X: Species occurs within the identified habitat.

Table P33. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern red bat				X*
Eastern small-footed myotis				
Hoary bat				X*
Marsh rice rat		X		
Silver-haired bat				X*
Southern bog lemming				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Acadian flycatcher				X
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Black-throated green warbler				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Cattle Egret		X		
Cerulean warbler				X
Common Barn owl			X	
Common nighthawk				
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Great blue heron		X		
Great crested flycatcher			X	
Great egret		X		
Green heron		X		
Horned lark			X	
Indigo bunting			X	
Least flycatcher				X
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Rose-breasted grosbeak				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Snowy egret		X		
Spotted sandpiper		X		
Tricolored heron		X		
Whip-poor-will				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Coastal plain milk snake				X
Eastern box turtle			X	X
Eastern kingsnake				X
Northern diamondback terrapin		X		
Spotted turtle			X	X
Amphibians				
Carpenter frog				X
Fowler's toad		X	X	X
Marbled salamander				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Amphibians (continued)				
Northern Spring Salamander				X
Insects				
A noctuid moth *Apharetra dentate*				X
A spanworm *Itame sp 1*				X
Buchholz's gray *Hypomecis buchholzaria*				X
Carter's noctuid moth *Spartiniphaga carterae*			X	
Daecke's pyralid moth *Crambus daeckellus*			X	
Doll's merolonche *Merolonche dolli*				X
Dotted skipper *Hesperia attalus*			X	
Hessel's hairstreak *Callophrys hesseli*				X
Lemmer's pinion moth *Lithophane lemmeri*				X
Pine Barrens bluet *Enallagma recurvatum*		X		
Pine Barrens zale *Zale sp 1*				X
Pink streak *Faronta rubripennis*				X
Placentia tiger moth *Grammia placentia*			X	
Scarlet bluet *Enallagma pictum*		X	X	
Southern ptichodis *Ptichodis bistrigata*			X	
Two-spotted skipper *Euphyes bimacula*		X		
Fish				
Banded sunfish**	X			
Black-banded sunfish	X			
Mud sunfish	X			

*Potential presence.
**Species are also recognized as target species of ecoregional concern by the Nature Conservancy – NJ Chapter.
X: Species occurs within the identified habitat.

Table P34. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck		X		
American woodcock			X	X
Canada goose (Atlantic population)	X	X		
Northern bobwhite			X	X
Virginia rail		X		
Wood duck		X		X

X: Species occurs within the identified habitat.

Table P35. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Pirate perch	X
Shield darter	X

X: Species occurs within the identified habitat.

Table P36. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Northern Pinelands

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Disturbance and encroachment from the more developed townships of Dover, Howell, Freehold, Lakewood, and Berkeley threaten nesting raptors, corn snakes, northern pine snakes, timber rattlesnakes, and other forest-dwelling species. Major roads such as Route 532, Route 70, and Route 72 transect large forest patches and have a serious impact on many of the less vagile species of rare wildlife such as snakes and amphibians. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, maintain, enhance and/or restore endangered, threatened and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of forest and forested wetlands as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife including interior-forest raptors and passerines, timber rattlesnake, corn snake, northern pine snake, freshwater wetland birds, rare reptiles and amphibians, and rare dragonflies, damselflies, butterflies, and moths.
- Identify, protect, maintain, enhance, and restore important early succession (areas comprised of <5% woody vegetation, with a mix of native grasses, forbes and bare soil) as identified by the Landscape Project for grassland birds and scrub-shrub/open field wildlife populations.
- Identify, protect, maintain, enhance, and restore critical aquatic ecosystems, riverine and riparian habitats, and water quality to preserve aquatic ecosystems particularly for species

of conservation concern that rely on high water quality or low pH waters such as rare reptiles, amphibians, and native fish
- Protect and restore and characteristic Pinelands communities.
- Preserve the ecological quality and integrity of wetland habitats and vernal pool communities.
- Inventory, determine distribution, and monitor wildlife and nongame fish species of greatest conservation need.
- Prevent, stabilize, and reverse declines of interior-forest raptors and passerines, timber rattlesnake, corn snake, northern pine snake, freshwater wetland birds, rare reptiles and amphibians, rare dragonflies, damselflies, moths, and butterflies, grassland and scrub-shrub/open field wildlife populations, freshwater mussels, and native Pinelands fish species such as the blackbanded sunfish, banded sunfish, mud sunfish, and pirate perch.
- Prevent illegal collection of rare reptiles and amphibians.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Assess large-scale habitat change (every five to 10 years).
- Promote public education and awareness and wildlife conservation.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Pinelands Regional Landscape stakeholders during a meeting held on June 13, 2007 (see *Attachment I*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Action
Protect critical habitats identified by the Landscape Project and critical aquatic habitats	
1°	Review existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat - Landscape Project)*
1°	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*

Priority	Conservation Action (continued)
Protect critical forest and forested wetlands habitats identified in the Landscape Project	
1º	Manage forests on a regional scale to provide a mix of seral (successional) stages for a wide range of forest-dwelling species (e.g., woodland raptors, northern pine snakes, pine warbler, black-throated green warbler, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. These forest types include but are not limited to: mature and near-mature forests with large trees, > 80% canopy closure and an uneven-age structure; mature forests with 65-85% canopy closure and structural diversity; pine-oak savanna with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess critical core forests for forest-interior songbirds, forest raptors (red-shouldered hawk, barred owl), forest-dwelling bats, northern pine snakes, corn snakes, timber rattlesnakes, and bald eagles. Take action to minimize habitat loss and maintain large core areas by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, forest management and stewardship plans. Maintain information in the Landscape Project and Biotics database, and provide this information to the Pinelands Commission. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing healthy Pinelands forests. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and wildlife surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*

Priority	Conservation Action (continued)
2º	Develop a species occurrence area of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). As GIS data layers become available, develop a predictable model of Indiana bat summer habitat. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
Protect critical early successional habitats identified in the Landscape Project	
1º	Research different techniques for maintaining suitable habitat for species dependent on early successional habitats (e.g., prescribed burning, mowing, brush-hogging, and other methods). *(Conserve wildlife – rare wildlife)*
1º	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing early succession habitats which will improve habitat quality for grassland- and scrub-shrub-dependent species. BMPs will be implemented on public lands, large patches of grasslands such as at Lakehurst Naval Station, and along some utility line rights-of-way (scrub-shrub). *(Protect habitat – humans; Conserve wildlife – rare wildlife; Agriculture – land management; Other practices – land management)*
2º	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed; this can be accomplished through public education and incentive programs. Continue to evaluate the effectiveness of delayed mowing for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. *(Protect habitat – humans; Enhance habitat –private lands)*
2º	Use GIS measures, other remote sensing tools, and wildlife surveys to identify grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for mowing, prescribed burning) strategies to maintain and enhance these habitats in perpetuity. Focus on habitat patches that can be managed at a size and scale that is similar to historic patch size of this habitat type as being researched by the Pinelands Commission as part of their "Right-of-way Project." *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height), assess their condition for nesting birds (golden-winged warbler and woodcock) and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create them. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*

Priority	Conservation Action (continued)
2º	Maintain existing early succession habitats and work to establish new grassland and scrub-shrub habitats along utility line rights-of-way and in association with fire breaks and fuel breaks where appropriate. Creation of these habitats should be planned so they benefit grassland- and scrub-shrub-dependent species. Manage some rights-of-way for scrub-shrub species with small area requirements. *(Conserve wildlife – rare wildlife)*
Protect critical riverine and riparian habitats identified in the Landscape Project	
2º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl), forest-interior songbirds, timber rattlesnakes, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Identify and protect habitat for fish by performing QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and plotting distributions of special concern fish species (as identified by the Delphi process), and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish)*
Protect and restore characteristic Pinelands communities	
1º	Restore the dynamic nature of this ecosystem by developing management plans for state lands which incorporate the needs of Pinelands plants and animals and generate the spatial patch diversity needed by species within this community. *(Conserve wildlife – rare wildlife)*
1º	Research different management techniques (e.g., ecologically-based forestry activities, prescribed burns) that might be used to mimic the historic role of fire and other natural disturbances in shaping this ecosystem. Implement appropriate management actions in areas where natural disturbances, such as wildfire, have been precluded. *(Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
1º	Identify, enhance, and restore Atlantic white cedar communities within the Pinelands for timber rattlesnakes, black-throated green warblers, red-shouldered hawks, barred owls, and Cooper's hawks. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Work with the Division of Parks and Forestry including the Office of Natural Lands Management, the Forest Fire Service, and Forest Service to determine the historic and future role of fire in the creation and management of unique Pinelands communities. *(Conserve wildlife – rare wildlife)*
2º	Develop, implement, and evaluate best management practices (BMPs) for utility line rights-of-way that favor the establishment and persistence of native, early-successional Pinelands communities. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
Preserve the ecological quality and integrity of wetlands and vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool-dependent species. *(Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat – private lands)*
2º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Conserve wildlife – rare wildlife)*
2º	Maintain stream water chemistry/ water quality important for species native to the Pinelands by limiting developed land and upland agriculture to less than 10% of a watershed. For example, maintain low pH waters important for breeding populations of carpenter frogs. *(Conserve wildlife – rare wildlife; (Protect habitat – rare wildlife)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.
1º	Conduct surveys and determine the eastern range limit of the Pine Barrens treefrog. *(Protect habitat - Landscape Project)*
1º	Conduct surveys for dragonflies and damselflies in appropriate habitats throughout the Northern Pinelands to determine species distributions and identify habitat protection needs. *(Enhance habitat - odonata)*

Priority	Conservation Action (continued)
1º	Conduct surveys and work with herpetologists to locate undocumented hibernacula of corn snakes, northern pine snakes, and timber rattlesnakes, and incorporate data into the Biotics database and Landscape Project. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
1º	Determine baseline abundance and establish long-term monitoring programs for wildlife of greatest conservation need (e.g., develop population estimates for rare Pineland species and conduct range-wide surveys every four years). *(Monitor wildlife – long-term monitoring)*
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for endangered, threatened, and native Pinelands species. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills and common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Monitor wildlife – long-term monitoring)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct concentrated field sampling for listed or special concern fish species at areas indicated by FishTrack Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and develop a model of suitable northern diamondback terrapin nesting areas. *(Protect habitat - Landscape Project)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify northern diamondback terrapin key crossing areas and work with local or state transportation agencies to erect turtle barriers. *(Protect habitat – roads)*

Priority	Conservation Action (continued)
2º	Research population distribution of northern diamondback terrapin to determine critical areas for protection. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of rare wildlife , freshwater mussels, and native Pinelands fish species	
1º	Evaluate and assess the potential impacts of wind turbines to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on birds and bats. *(Protect habitat - humans)*
1º	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Division of Parks and Forestry to designate riding areas and BMPs should be developed. *(Conserve wildlife – rare wildlife; Protect habitat – humans)*
1º	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g. wildlife underpasses, road closures). *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, and how water quality degradation and contaminants affect rare species. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement proactive habitat conservation goals that will meet and maintain recovery needs of endangered and threatened wildlife and fish populations, particularly for those restricted to the Pinelands region. These include guidelines for forest silviculture on public and private lands to enhance forest health and habitat diversity. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands)*
1º	Investigate the impact of land-use patterns on Pine Barrens treefrog. Develop and implement proactive habitat management/conservation plans for Pine Barrens treefrogs. Such a plan should include working with regulators to maintain water quality of breeding ponds (low pH) and protect suitable buffers on ponds, ongoing surveys for this species to identify healthy populations, and a scheme to protect habitats that connect populations and maintain viable metapopulations. *(Conserve wildlife – rare wildlife)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat - fish)*

Priority	Conservation Action (continued)
1º	Research the effects of current prescribed burning practices on Pinelands dependent species and work with foresters to develop and implement effective forest management and stewardship plans to increase or maintain the habitat quality for these species in the Pinelands. *(Conserve wildlife – rare wildlife)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife–cats, subsidized predators)*
1º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
1º	Research the habitat requirements for species of conservation concern and implement planned silviculture practices to enhance forests for these species. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
2º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
2º	Work with the Pinelands Commission to investigate terrestrial habitat requirements for the northern pine snake, and develop a predictive model to identify pine snake habitat and habitat use at critical life stage sites (e.g., nesting areas) that require additional protection from collection, disturbance, and destruction. Such a model could be a fundamental tool used in the Pinelands Commission's evaluation of development applications. *(Protect habitat - Landscape Project; Conserve wildlife – rare wildlife)*
2º	Work with public and private landowners and managers with significant bald eagle, timber rattlesnake, northern pine snake, Pine Barrens treefrog, cavity-nester, freshwater wetland bird, grassland bird, raptor, and scrub-shrub/open field bird populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Enhance habitat – private lands; Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
2º	Determine carrying capacity of pinelands wetlands for breeding wood ducks, including available nest cavities and breeding season food resources. Use this data to develop appropriate management strategies (e.g., installation of wood duck boxes or habitat management to enhance and support targeted native invertebrate populations). *(Conserve wildlife – game species)*

Priority	Conservation Action (continued)
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant elevated or listed status among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Identify critical habitats and assess their condition for breeding, migratory and wintering waterfowl. Identify protection strategies to maintain existing waterfowl habitat. *(Protect habitat – game species)*
2º	Identify and implement best management practices for bald eagle, forest-interior passerine and raptor habitat, and migratory stopover areas. *(Conserve wildlife – rare wildlife)*
Prevent illegal collection of rare amphibians and reptiles	
1º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens), particularly those used by corn snakes, northern pine snakes, and timber rattlesnakes, to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
2º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry's park police to enforce protection of native wildlife from illegal collection (including bog and wood turtles, and northern pine and corn snakes, timber rattlesnakes, Pine Barrens treefrog), persecution (timber rattlesnakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with appropriate government agencies to survey for and monitor the spread of invasive insect species that jeopardize the health of Pinelands forest types (e.g., Atlantic white cedar, pitch-pine lowlands, oak-pine uplands, and others). *(Evaluate restoration – invasives)*

Priority	Conservation Action (continued)
1º	Work with public and private landowners and managers and regulatory agencies to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened or priority wildlife species and are being threatened by invasive non-indigenous plants. Control measures often cause soil disturbance that increases the chance of invasion by the same or other non-indigenous plants. *(Conserve wildlife - invasives)*
2º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Conserve wildlife – deer; Evaluate restoration - deer)*
2º	Work with the Division of Fish and Wildlife to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration. *(Conserve wildlife – deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer. *(Conserve wildlife – deer)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Promote public awareness and conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

Priority	Conservation Action (continued)
1º	Develop and encourage nature tourism opportunities in the Pinelands including wildlife viewing sites, interpretive signage highlighting unique ecosystems/habitats, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter, and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Develop educational programs, brochures and posters for the public regarding tolerance and protection of timber rattlesnakes and their habitat. *(Education - humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop educational brochures and posters describing habitat management practices that can be carried out on both private and pubic lands. These brochures and posters should focus on the management, enhancement, and creation of habitat for early success ional species and include descriptions of various forestry management techniques; the primary and secondary benefits of prescribed burning should be highlighted. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species. *(Education - humans)*

f. Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect bald eagle, red-headed woodpecker, cavity-nester, forest passerine, freshwater wetland bird, grassland bird, raptor, and scrub-shrub/open field bird nesting sites.

- Utilize incentive programs that encourage the management of forests, grassland and scrub-shrub communities.
- Through incentive programs, encourage private landowners surrounding public natural lands to manage land for large forest patches in order to increase effective size and connectivity of forests.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
- Encourage farmers to preserve farmland with conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of forests, grassland and scrub-shrub communities.
- Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions and harmful insect infestations. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
- Work with landowners to maintain/enhance existing habitats where listed and special concern fish species occur.
- In the context of landowner incentive programs such as LIP, Forestry Stewardship, etc., work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups (Pineland Preservation Alliance (PPA), NJ Audubon Society (NJAS), local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation (NJCF)) and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
    - Continue volunteer-based summer bat concentration surveys.
    - Collaborate with environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for lepidoptera species.
    - Involve Citizen Scientists in management and protection projects, such as protection and posting of bald eagle nesting areas and fencing high road-kill areas for northern diamondback terrapin.
- Collaborate with NJAS to educate public on the effects of feral cats on wildlife species of conservation concern.
- Promote backyard habitat management for migratory raptors and passerines, and for vernal pools where appropriate.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.

- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with Pinelands Preservation Alliance (PPA), The Nature Conservancy-NJ Chapter (TNC), NJ Audubon Society (NJAS), NJ Conservation Foundation (NJCF), and environmental, member-based organizations to protect and enhance habitats.
    - Work with environmental, member-based organizations to protect and enhance large tracts of contiguous forest, especially those adjacent to state lands, beneficial to bald eagle, barred owl, cavity-nesters, and raptor nesting and foraging sites.
    - Work with TNC, NJAS and other environmental, member-based organizations to manage and protect bald eagle, red-headed woodpecker, cavity-nester, and raptor nesting and foraging sites.
    - Work with PPA, TNC, NJAS and other environmental, member-based organizations to protect and enhance sites hosting significant populations of rare dragonflies, damselflies, moths, and butterflies on conservation lands. Consult with conservation organizations to develop educational programs.
    - Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants and invasive insects that can affect forest health.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
- Continue participating in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA's Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) - NJ Field Office, US Department of Defense (DOD), and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats and protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Divisions of Fish and Wildlife (DFW) to collaborate with the Pinelands Commission to identify and protect important habitat for wildlife. When appropriate, change the boundaries of Pinelands Management Areas to better manage development around sensitive areas.
    - Identify valuable habitats for preservation and work with the DEP's Green Acres Program to pursue acquisition of these important areas.
    - Foster a relationship between the DFW and private/public landowners to restrict the use of off-road vehicles in critical wildlife habitats.
    - DFW and USFWS to work with New Jersey's Forest Fire Service and the DEP's Office of Natural Lands Management to develop a strategy for introducing fire ecology back into the Pinelands ecosystem through the use of prescribed burns.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bald eagle sites.

  - DFW and DEP's Land Use Regulation Program to work with the Pinelands Commission to protect sensitive areas around timber rattlesnake hibernacula.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - ENSP, conservation organizations, DEP's Land Use Regulation Program, and the Pinelands Commission to work together to protect vernal pools and appropriately classify wetlands for spotted turtle and special concern amphibian populations.
  - Expand efforts to create habitat and implement best management practices for northern pine snakes, cavity-nesters, forest passerines, freshwater wetland birds, raptors, and scrub-shrub birds on state lands and with other natural resource managers, county and municipal utility authorities and planners.
  - Encourage greater buffers for forest passerines along riparian and floodplain areas with the Pinelands Commission.
  - DFW to work with Lakehurst Naval Station to develop a plan to maintain upland sandpiper, vesper sparrow, grasshopper sparrow, and savannah sparrow habitats by impeding succession with controlled burns and scheduled mowing.
  - DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
  - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
  - DFW to work with USFWS and other state and federal partners to implement the American Woodcock Management Plan as appropriate.
  - DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades for water bodies where listed or special concern species occur.
  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with the Land Use Regulation Program to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to work with the USFWS, National Park Service and Department of Defense to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control invasive plants in critical wildlife habitats.
  - NJDFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
- DFW to lead in the development of educational materials for public and private landowners about forest-dependent and grassland-dependent wildlife and their habitats.

- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Monitor abundance, productivity, distribution, and trends of upland sandpiper, bald eagle, red-headed woodpecker, timber rattlesnake, cavity-nester, colonial waterbird, forest passerine, freshwater wetland birds, grassland bird, raptor, and scrub-shrub/open field bird populations.
- Monitor contaminant levels that may impact bald eagle populations.
- Monitor population trends, breeding success, and habitat of timber rattlesnakes and northern pine snakes.
- Routinely monitor the population trends of special concern reptiles and special concern amphibians.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

Skylands Landscape

Contents of the Chapter on the Skylands Landscape

The Skylands Landscape extends northwest of the Piedmont Plains, from the southern tip of Hunterdon County to the headwaters of the Ramapo River. The Skylands include all or parts of Hunterdon, Somerset, Warren, Morris, Passaic, and Sussex counties. The Delaware and the North and South Branch of the Raritan River are the prominent rivers and watershed regions in the Skylands.

A. Ecological Units in the Skylands Landscape

The Skylands run across the Hudson Valley, Lower New England, and Northern Appalachian Piedmont Sections. The Hudson Valley in the Skylands has two subsections, the Kittatinny-Shawangunk Ridges (or the Kittatinny Ridge in New Jersey) (221Bd) and the Hudson Limestone Valley (or the Kittatinny Valley). The Lower New England Section consists of two subsections in northwestern New Jersey, the Hudson Highlands (221Ae) and the Reading Prong (221Am). The Skylands also include a portion of the Gettysburg Piedmont Lowland (221Da) subsection of the Northern Appalachian Piedmont.

B. Geology and Climate

The Ridge and Valley, Highlands, and Piedmont physiographic provinces make up the foundation of the Skylands Landscape. Within the Ridge and Valley province, the Kittatinny Ridge is a steep ridge that spans across New Jersey into Pennsylvania and New York. It rises to more than 549 meters (1,801 feet) in elevation. The Kittatinny Valley is a very broad valley of shale and limestone that dips to 122 meters (400 feet) above sea level and lies between the Kittatinny Ridge and the northern extent of the Highlands province's gneiss and granite rocks. The Highlands province consists of the Reading Prong and the southern tip of the Hudson Highlands subsections. From southwest to northeast, broad uplands and narrow valleys of the Reading Prong give way to high hills above 427 meters (1,400 feet) with steep-sided valleys and

glacial lakes of the Hudson Highlands. To the southeast of the Highlands, the landscape opens up to the rolling hills and wide river valleys of the Gettysburg Piedmont Lowland subsection. The average temperature in the Skylands is between 8.9°C and 12.2ºC (48 and 54 degrees F.) and the growing season varies between 130 and 180 days. The average annual precipitation is between 1,118mm (44 in.) and 1,270 mm (50 in.).

C. Habitats and Conservation Priority Areas of the Skylands Landscape

The Skylands are dominated by contiguous northern mixed-hardwoods forests, including oak, maple, birch, ash, hickory, hemlock, with white pine, pitch pine-scrub oak forests on the mountaintops, and hemlock ravines alongside mountain streams (252,550 hectares or 975 sq. mi. of forests and 42,778 hectares or 165 sq. mi. of forested wetlands). The valleys that lie between the ridges consist of cultivated fields, grasslands and meadows (91,250 hectares or 352 sq. mi.). It is important to note that habitats identified as "grassland" within the Landscape Map and throughout this document include agricultural lands and therefore, are not necessarily suitable habitats for grassland species. Similarly, scrub-shrub habitat is included in the "forest" and "forested wetlands' habitats on the Landscape Maps. Wetlands (14,608 hectares or 56 sq. mi.) include limestone fens, floodplains, spring-fed wetlands, and the largest concentration of glacial lakes in New Jersey. The Skylands' large areas of public land and contiguous habitat from the Delaware River to the Kittatinny Ridge, Kittatinny Valley, Wawayanda State Park, and the Rockaway River present tremendous conservation opportunities, despite the pressures of expanding development from the New York metropolitan area (Figure 27).

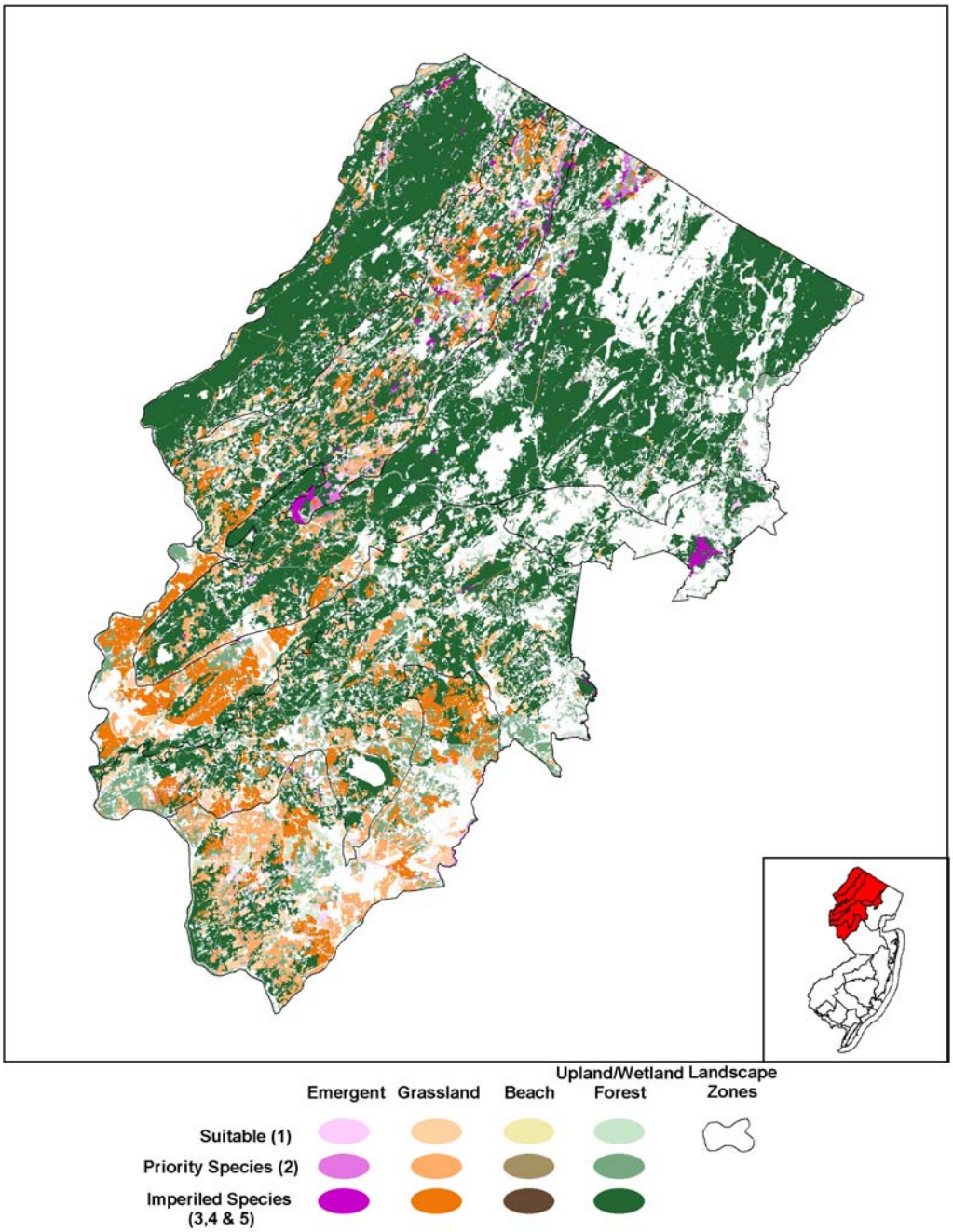
Seven Priority Conservation Zones are identified within the Skylands Region. The zones are delineated by the similarity of habitat types. A description of the habitat types and major land use/land cover types are found in each of the zone sections within this region.

(1) Upper Delaware River Valley and Kittatinny Ridge
(2) Kittatinny Valley
(3) Northern Highlands
(4) Delaware and Musconetcong River Valleys
(5) Central Highlands
(6) Urban Highlands
(7) Southern Highlands

D. Wildlife of Greatest Conservation Need of the Skylands Landscape

The Skylands Landscape Region supports three federal endangered and threatened, 15 state endangered, 15 state threatened, and 67 special concern wildlife species. The only known hibernacula for the federal endangered Indiana bats occur in the region's abandoned iron mines. Bog turtles persist on wet meadows and fens in the vast limestone valleys of the Skylands. The region provides riverine and wetland habitat for wood turtles and the only viable population of federal endangered dwarf wedgemussels in New Jersey. The large, contiguous tracts of northern hardwood forest in the Skylands Region are habitat for forest-interior wildlife, including cavity-nesting birds, interior forest nesting passerines, and raptors. Bobcats persist throughout the region in forests and forested wetlands that are not yet highly fragmented by development or agriculture. Rocky outcroppings along mountain ridges provide habitat for timber rattlesnakes. The agricultural landscape of the valleys provides habitat for grassland birds.

Figure 27. Critical landscape habitats within the Skylands Landscape and associated conservation zones as identified through the Landscape Map (v2).



Successful management of the Skylands Landscape is essential to preserving numerous species and suites of species in New Jersey, such as Indiana bat, forest-dwelling bats, bobcat, red-shouldered hawk, northern goshawk, barred owl, forest passerines, grassland birds, scrub-shrub birds, bog turtle, wood turtle, timber rattlesnake, blue-spotted salamander, long-tailed salamander, and dwarf wedgemussel. The majority of the state's remaining native brook trout populations occur in this region's high-water-quality streams. The Skylands Landscape plays a crucial role in the conservation of the following species or species groups: the northern copperhead, eastern box turtle, spotted turtle, northern spring salamander, and vernal pool breeders and special concern mussels. The Skylands Landscape plays an accessory role in the conservation of the Fowler's toad, freshwater wetland birds, and rare dragonflies, damselflies, moths and butterflies.

The Skylands Landscape is characterized by a broad array of habitat types that support a wide variety of wildlife species. Among the more prominent features of the region are the large, contiguous forests of the Kittatinny Ridge and Northern Highlands zones. These provide critical habitat for area-sensitive wildlife such as bobcats, forest-dwelling bats, woodland raptors, neotropical migrant songbirds, and timber rattlesnakes. The region's numerous limestone fens, vernal pools, and emergent, riparian and forested wetlands provide critical habitat for freshwater wetland birds, bog turtles, blue-spotted salamanders, and a host of other special concern reptiles and amphibians. The clear, unpolluted rivers and streams provide critical habitat for dwarf wedgemussels and other mollusks, wood turtles and long-tailed salamanders. The Kittatinny Valley has a rich history of agriculture and is characterized by open farmlands and smaller forest patches interspersed. Some larger forest patches persist throughout this zone and provide habitat for area-sensitive species. The Delaware and Musconetcong River Valley and Central and Southern Highlands zones contain more highly fragmented habitats that are dominated by agricultural fields and smaller forest patches. Relatively few areas remain in this zone that provide suitable habitat for area-sensitive forest-dwelling species.

Tables S1 – S8 (shown after *Threats to the Wildlife and Habitats of the Skylands Landscape Region*) list the wildlife of greatest conservation need, the suites of wildlife, and the conservation opportunity areas to conserve them in the Skylands. The wildlife are prioritized by federal endangered and threatened, state endangered, state threatened, and special concern status.

E. Threats to the Wildlife and Habitats of the Skylands Landscape Region

Loss, alteration and fragmentation of all habitat types within the Skylands Landscape pose the greatest threats to wildlife in this region. Habitat loss results from development and is occurring at an alarming rate in northern New Jersey. Fragmentation alters the habitat by breaking up large contiguous blocks into smaller patches that are unsuitable for area-sensitive species. New roads fragment habitats and create barriers to animal movements between habitats. Preserving the remaining large, contiguous blocks of habitat, and maintaining connectivity between them, is critical to the long-term viability of area-sensitive wildlife populations in the Skylands.

The discontinuity of emergent and forested wetlands along with the loss of other suitable corridors may eventually lead to the genetic bottlenecking of both bog turtles and spotted turtles. Contamination and alteration of waterways and wetlands, in combination with increased human encroachment into these riparian areas, affect all wetland dependent species and species groups.

Non-point source pollution, unrestricted livestock access, reduction in stream flows, stream cleaning activities, culvert construction and the persistence of dams all have an impact on riparian and riverine species. Human encroachment on wetland habitats often results in an increase in invasive and exotic flora becoming more dominant. These species often decimate native wetland plant communities and can have a deleterious effect on wetland hydrology that results in a loss of habitat value to wetland-dependent wildlife. Illegal collection for the pet trade remains an important problem for many of our rare turtle species.

Invasive, non-indigenous species often cause substantial ecological and economic problems. They frequently have competitive advantages because of the absence of predators, diseases and competitors that they evolved with in other ecosystems or because of more efficient mechanisms of reproduction, dispersal or use of resources. They occur in every broad habitat type that occurs in the state. Invasive, non-indigenous plants threaten species diversity, composition and structure of our fields, forests, wetlands, and aquatic habitats. Invasive, non-indigenous invertebrates such as zebra mussels and Asiatic clams have the potential to adversely impact aquatic habitats and species. Plants such as the Eurasian water-milfoil and vertebrates such as the northern snakehead threaten our aquatic resources and habitats. Emerald ash borer and Asian longhorn beetles have the potential to severely damage our forests and wildlife habitat. Diseases such as West Nile virus have already impacted certain avian species.

New Jersey’s burgeoning white-tailed deer population poses a significant threat to forest health and forest regeneration. Especially in portions of the region where there is a paucity of public land where hunting is permitted. Deer damage coupled with anthropogenic (caused by man) factors has severely impacted some of New Jersey’s remaining public and private natural lands where hunting is not permitted. High numbers of deer find refuge in residential areas or on public and private land where hunting is not allowed. Over-browsing by deer can eliminate native shrub layers and damage breeding habitat for many species, particularly shrub-nesting birds. In addition, over-browsing by deer can create an environment conducive for invasive plants to germinate and crowd out native species and can eliminate rare plant communities.

Increased use of caves and mines for recreational activities poses a major threat to hibernating Indiana and other cave-dwelling bats because it forces them to use crucial fat reserves needed to survive the winter. During hibernation, cave-dwelling bats are highly susceptible to large-scale mortality due to vandalism.

Although New Jersey has an aggressive open space acquisition program, a large portion of critical wildlife habitat in this region remains in private ownership. This accentuates the need to protect, maintain, and enhance critical wildlife habitat on private lands. Without success in this arena we cannot adequately conserve rare species over the long term. With the recent passage of the Highlands Water Protection and Planning Act (Highlands Act), areas that lie within the designated Preservation Area will be afforded additional protection. It is still too early to predict how the Highlands Act will affect municipal land use and land preservation within the Skylands Landscape Region. However, the Highlands Act will result in additional protection for critical wildlife habitat in areas that lie within the Preservation Area. In the short term this will be accomplished through strict limitations on impervious cover; limitations on development on steep slopes, in forested areas, within 300-foot buffers of all water bodies, and in flood areas; and

implementation of Category One water quality protections on all Highlands waters. The Division of Fish and Wildlife will work with the Highlands Council to identify critical wildlife habitat through the use of the Landscape Project maps.

Prioritized List of the Wildlife of Greatest Conservation Need and their Location in the Skylands Landscape

Table S1. Federal Endangered and Threatened Species*

Common Name	Federal Status & Regional Priority	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Mammals								
Indiana bat	E	R**	R**	I		R**	R**	
Reptiles								
Bog turtle	T	I	I	I	I	I		I
Mollusks								
Dwarf wedgemussel	E & RP	I	I					
Insects								
American burying beetle♦	E		R		R	R		R
Mitchell's satyr♦	E		R					

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦Only historic records exist, species believed to be extirpated.
T: Federally threatened species.
E: Federally endangered species.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table S2. State Endangered Species

Common Name	Regional Priority	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Mammals								
Allegheny woodrat		R		R				
Bobcat		I	I	I		I	I	
Birds								
American bittern	RP	I	I	I		I		
Bald eagle	T	I	I	I		I		
Northern goshawk		I		I				
Northern harrier		I	I	I	I	I	I	I
Peregrine falcon		R						
Pied-billed grebe	RP	I	I	I			I	
Red-shouldered hawk		I	I	I		I	I	
Sedge wren	RP		I	I				
Short-eared owl	RP		R		R	R	R	R

State Endangered Species (continued)

Common Name	Regional Priority	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Birds (continued)								
Upland sandpiper	RP		R		I	I		I
Vesper sparrow		I	I	I	I	I		I
Reptiles								
Timber rattlesnake		I	I	I				
Amphibians								
Blue-spotted salamander			I				I	
Mollusks								
Brook floater	RP	I						
Green floater	RP						R	R
Insects								
Appalachian grizzled skipper		R*	R*		R*		R*	R*
Arogos skipper				I		R		

*Only historic records exist. Species believed to be extirpated.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table S3. State Threatened Species

Common Name	Regional Priority	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Birds								
Barred owl		I	I	I		I	I	
Black-crowned night-heron	RP	I	I	I			R	
Bobolink	RP	I	I	I	I	I		I
Cooper's hawk	RP	M	M	M	M	M	M	M
Grasshopper sparrow	RP	I	I	I	I	I		I
Long-eared owl		I	I	I		I	I	I
Osprey		R	R	I	I	I		I
Red-headed woodpecker	RP	I	I	I	I	I	I	
Savannah sparrow		I	I	I	I	I		I
Reptiles								
Wood turtle		I	I	I	I	I	I	I
Amphibians								
Long-tailed salamander		I	I	I	I			I
Mollusks								
Eastern lampmussel			I					

State Threatened Species (continued)

Common Name	Regional Priority	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Mollusks (continued)								
Tidewater mucket	RP	R	R	R	R	R	R	R
Common Name	**Regional Priority**	**Upper Delaware River Valley and Kittatinny Ridge**	**Kittatinny Valley**	**Northern Highlands**	**Delaware and Musconetcong River Valleys**	**Central Highlands**	**Urban Highlands**	**Southern Highlands**
Mollusks (continued)								
Triangle floater			I					
Yellow lampmussel	RP	M	M	M	M	M	M	M
Insects								
Silver-bordered fritillary		I	I	I				

RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table S4. Nongame Species of Conservation Concern

Common Name	Conservation Status	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Mammals								
Eastern small-footed bat	RP			I				
Eastern red bat	RP	R*	R*	R*	R	R*	R*	R*
Hoary bat	RP	R*	R*	R*	R*	R*	R*	R*
Long-tailed (Rock) shrew	RP	R						
Silver-haired bat	RP	R*	R*	R	R*	R*	R*	R*
Southern bog lemming	RP		R	R				
Birds								
Acadian flycatcher	RP	I	I	I	I	I		I
American golden-plover		M	M		M	M	M	
American kestrel	SC	I	I	I	I	I		I
Baltimore oriole	RP	I	I	I	I	I	I	I
Black-and-white warbler	RP	I	I	I	I	I	I	I
Black-billed cuckoo	RP	I	I	I		I		
Blackburnian warbler	RP	M		M				
Black-throated blue warbler	RP	M		M		M		
Black-throated green warbler	SC	I	I	I				
Blue-headed vireo (Solitary vireo)	SC	I		I				
Blue-winged warbler	RP	M	M	M	M	M	M	M

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Birds (continued)								
Broad-winged hawk	SC/ RP	M		M		M		
Brown thrasher	RP	I	I	I	I	I	I	I
Canada warbler	SC/ RP	I	I	I				
Cerulean warbler	SC/ RP	I	I	I	I	I		
Chimney swift	RP	I	I	I	I	I	I	I
Cliff swallow	SC	M	M	M	R	M	R	M
Common barn owl	SC	R	R		R	R	R	R
Common nighthawk	SC	R	R	R	R	R	R	R
Eastern kingbird	RP	I	I	I	I	I	I	I
Eastern meadowlark	SC/ RP	I	I	I	I	I		I
Eastern screech-owl	RP	M	M	M	M	M	M	M
Eastern towhee	RP	I	I	I	I	I	I	I
Eastern wood-pewee	RP	I	I	I	I	I	I	I
Field sparrow	RP	I	I	I	I	I	I	I
Golden-winged warbler	SC/ RP	I	I	I				
Gray catbird	RP	M	M	M	M	M	M	M
Gray-cheeked thrush	SC	M	M	M	M	M	M	M
Great blue heron	SC/ RP	M	M	M	M	M	M	M
Great crested flycatcher	RP	M	M	M	M	M	M	M
Green heron	RP	M	M	M	M	M	M	M
Hooded warbler	RP	M		M		M		M
Horned lark	SC	M	M					
Indigo bunting	RP	I	I	I	I	I	I	I
Kentucky warbler	SC/ RP	I	I		I	I		I
King rail	SC/ RP		I			I	I	
Least bittern	SC/ RP	I	I	I		I	I	
Least flycatcher	SC/ RP	I	I	I	I			
Louisiana waterthrush	RP	I	I	I		I		I
Marsh wren	RP			M		M		
Northern flicker	RP	M	M	M	M	M	M	M
Northern parula	SC	M	M	M		M		M
Pine warbler	RP	M	M	M		M	M	
Prairie warbler	RP	I	I	I	I	I	I	I
Purple finch	RP	I	I	I	I	I		I
Rose-breasted grosbeak	RP	I	I	I	I	I	I	I
Scarlet tanager	RP	M	M	M	M	M	M	M
Sharp-shinned hawk	SC/ RP	M		M	M	M		M
Spotted Sandpiper	SC	M		M	M			
Veery	SC	I	I	I	I	I	I	I
Whip-poor-will	RP	R	R	R				
Willow flycatcher	RP	I	I	I	I	I	I	I

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Birds (continued)								
Winter wren	SC	M		M				
Wood thrush	RP	I	I	I	I	I	I	I
Worm-eating warbler	RP	I	I	I	I	I		I
Yellow-billed sapsucker	RP	M	M	M	M	M	M	M
Yellow-billed cuckoo	RP	I	I	I	I			
Yellow-breasted chat	SC/ RP	I	I	I				
Yellow-throated vireo	RP	M	M	M	M	M	M	M
Yellow-throated warbler	RP	M	M	M	M	M	M	M
Reptiles								
Eastern box turtle	SC	M	M	M	M	M	M	M
Northern copperhead	SC	M	R	M		M	M	M
Eastern hognose snake	RP	M	M	M				
Eastern ribbon snake	RP	M	M	M	M	M	M	M
Spotted turtle	SC	M	M	M		M	M	M
Amphibians								
Carpenter frog	SC			M	M	M		M
Fowler's toad	SC	M	M	M	M	M	M	M
Jefferson salamander	SC	M	M	M		M	M	M
Marbled salamander	SC	M	M	M		M	M	M
Northern spring salamander	SC	M	M	M	M	M		M
Mollusks								
Creeper	SC	I	I					
Insects								
Extra-striped snaketail		X						
Harris's checkerspot	SC			M				
New England bluet		X	X	X				
Northern metalmark	SC	M	M					
A noctuid moth (*Cucullia alfarata*)			X					
2-spotted skipper				X				
Clubtail dragonfly		X			X			
Pitcher plant borer moth			X					
Schweitzer's buckmoth			X	X				

Nongame Species of Conservation Concern (continued)

Common Name	Conservation Status	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Fish								
American brook lamprey**	RP	I	I	I	I	I	I	I
Bridle shiner	RP	I	I	I		I		I

*Potential presence.
**Species are also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter.
SC: Species of special concern as identified within the state.
RP: Species is of regional priority; currently only mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

Table S5. Game Species of Regional Priority

Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Regional Priority	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Birds								
American black duck	RP	I	I	I	I	I	I	I
Canada goose (Atlantic population)	RP	M	M	M	M	M	M	M
Wood duck	RP	M	M	M	M	M	M	M
American woodcock	RP	I	I	I	I	I	I	I
Northern bobwhite quail	RP				R	R		R
Virginia rail	RP	R	R	R	R	R	R	R
Fish								
Brook trout*	RP	I	I	I	I	I		

*Species is a New Jersey game species, but is also an excellent indicator of water quality.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

Table S6. Fish Species

Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Fish							
Comely shiner					X		X
Cutlips minnow	X	X	X	X	X	X	X
Hickory shad					X		X
Ironcolor shiner			X				
Margined madtom	X	X		X	X	X	X
Northern hogsucker	X						
Shield darter	X			X	X		X
Slimy sculpin	X	X	X	X	X	X	X

X: Species present. Management strategy not yet determined.

Table S7. Game Species

Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Regional Priority	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Mammals								
River otter	-	M	M	M	M	M	M	M
Birds								
Ruffed grouse	-	R	R	R	R	R	R	R
Sora rail	-	R	R	R	R	R	R	R
Fish								
Brown trout*	-	I	I	I	I	I		
Rainbow trout*	-	I	I	I	I			

* Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.

M: Maintain population, species occurs within specific habitat(s) of landscape region.

I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.

R: Research and restore population, suitable habitat, species presence unknown.

X: Species present. Management strategy not yet determined.

Table S8. Suites of Wildlife and their Location in the Skylands Landscape

Common Name	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Mammals							
Forest-dwelling Large Mammals	X	X	X		X		
Forest-dwelling Bats	X	X	X	X	X	X	X
Birds							
Interior-forest Cavity-nesters	X	X	X	X	X		
Savannah and Forest-edge Habitat Cavity Nesters	X	X	X	X	X	X	X
Chimney Swift	X	X	X	X	X	X	X
Cliff Swallow	X	X	X				X
Colonial Waterbirds	X	X	X	X	X	X	
Common Nighthawk	X	X	X	X	X	X	X
Forest Passerines	X	X	X	X	X	X	X
Freshwater Wetland Birds	X	X	X	X	X	X	
Grassland Birds	X	X	X	X	X		X
Migratory Songbirds and Raptors	X	X	X	X	X	X	X
Peregrine Falcon	X						
Forest Raptors	X	X	X	X	X	X	
Scrub-shrub/Open Field (3-7 yrs) Birds	X	X	X	X	X	X	X
Early Succession (0 -3 years) Open Field Birds	X	X		X	X	X	X
Waterfowl	X	X	X	X	X	X	X
Reptiles							
Forest-dwelling Reptiles	X	X	X	X	X	X	X
Reptile Inhabitants of Wetland, Marsh and Bog	X	X	X	X	X	X	X
Reptiles Associated with water (lakes, ponds, streams)	X	X	X	X	X	X	X
Reptiles of Special Concern	X	X	X	X	X	X	
Amphibians							
Amphibians of Special Concern	X	X	X	X	X	X	
Vernal Pool and Vernal Sinkhole Breeders	X	X	X	X	X	X	X
Limestone Fen Inhabitants		X	X				
Mollusks							
Mollusks of Special Concern	X	X					
Insects							
Lepidoptera of Federal or State Legal Status			X				

Suites of Wildlife and their Location in the Skylands Landscape (continued)

Common Name	Upper Delaware River Valley and Kittatinny Ridge	Kittatinny Valley	Northern Highlands	Delaware and Musconetcong River Valleys	Central Highlands	Urban Highlands	Southern Highlands
Insects (continued)							
Lepidoptera of Special Concern		X	X				
Odonata of Special Concern	X	X	X				

X: Species occurs within the identified habitat.

F. Priority Conservation Zones, Assessments, and Strategies within the Skylands

1. Upper Delaware River Valley and Kittatinny Ridge

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

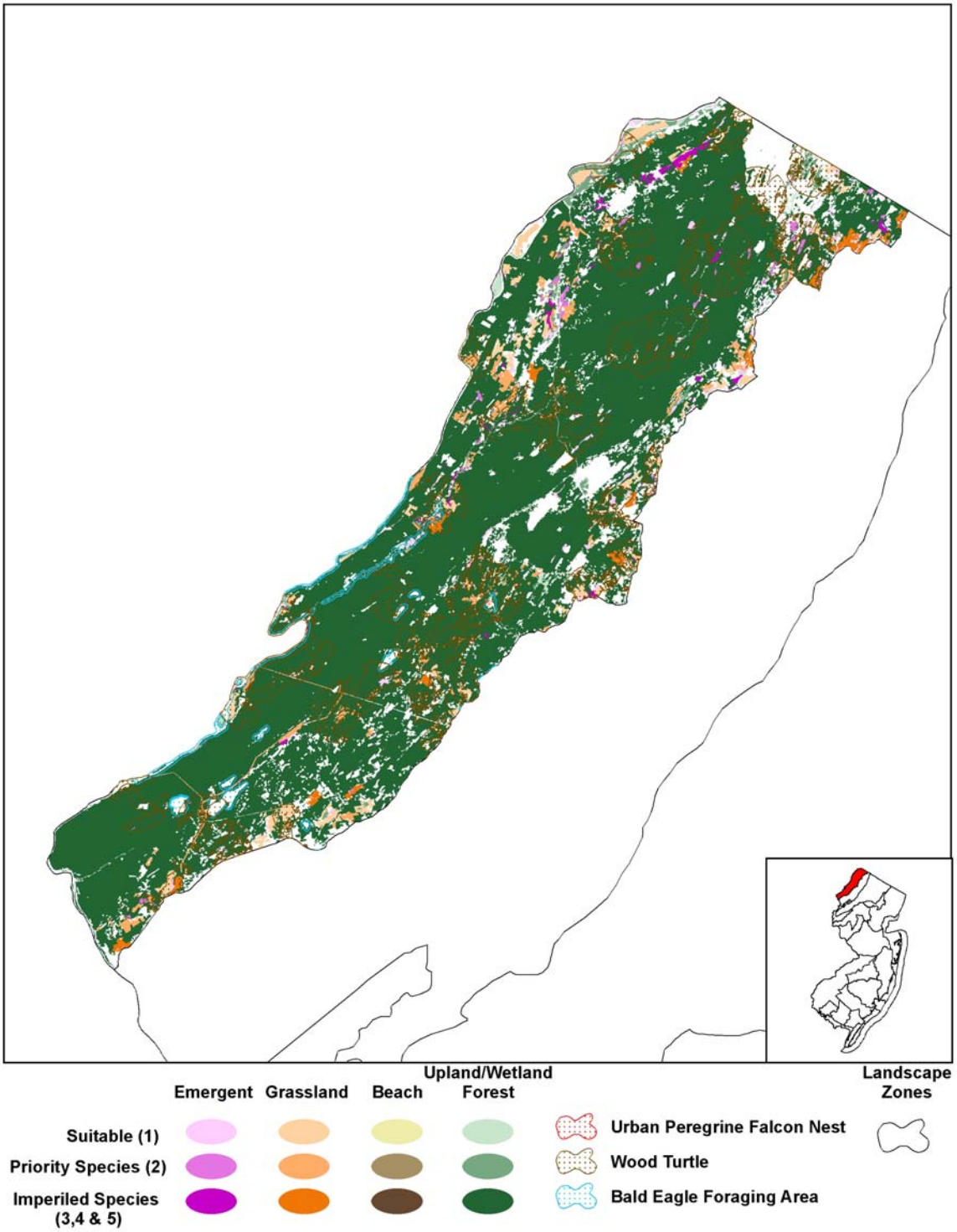
The Upper Delaware River Valley and Kittatinny Ridge encompass the area in New Jersey southwest to northeast along the Delaware River upstream from U.S. Interstate 80 and west from the Kittatinny Valley in the Ridge and Valley physiographic province (Figure 28). Much of this Priority Conservation Zone is preserved as public land. It includes the Big Flat Brook Watershed, the Little Flat Brook Watershed, and the Kittatinny Ridge. Opportunities exist for conservation at the Mashipacong Preserve, Hainesville Wildlife Management Area (WMA), Flat Brook WMA, Roy WMA, Delaware Water Gap National Recreation Area (DWGNRA), Worthington State Forest, Stokes State Forest, and High Point State Park.

Much of the wildlife habitat in this region of the state is a contiguous, maturing mixed hardwood oak-dominated forest. Ridge-tops are covered with pitch pine-scrub oak communities. The Kittatinny Ridge is an important migration corridor for raptors and passerines. Hemlock stands inhabit the ravines created by small streams that flow from the ridge. The forest continues up to the Wild and Scenic Delaware River, with floodplain forest patches of sycamore, silver maple, river birch, and American elm along its banks. The river is an important migration corridor for waterfowl, ospreys, and other birds. Wetland habitats in the Priority Conservation Zone include glacial lakes, beaver-dammed ponds and lakes, artificial farm ponds, wet meadows with thick hummocks, fens, seeps, and vernal pools. Abandoned beaver meadows have become densely covered scrub-shrub habitat, with thickets of alders, willow, and buttonbush. The paucity of pastureland, cropland, old fields, and utility corridors in this zone provide limited habitat for grassland wildlife. A limited amount of early succession (grassland and scrub-shrub) habitat exists and is being maintained within the DWGNRA along the Delaware River on the western side of the Kittatinny Ridge.

b. Wildlife of Greatest Conservation Need

The Upper Delaware Valley and Kittatinny Ridge support four federal endangered and threatened, 14 state endangered, 12 state threatened, and 66 special concern and regional priority wildlife species, in addition to five game species of regional priority and five nongame fish species currently without state or regional status. The federal listed species include the endangered dwarf wedgemussel, the threatened bald eagle, and the threatened bog turtle. The state endangered species include the bobcat, American bittern, northern goshawk, red-shouldered hawk, timber rattlesnake, and brook floater. The state threatened species include the barred owl, bobolink, Cooper's hawk, red-headed woodpecker, savannah sparrow, wood turtle, long-tailed salamander, and silver-bordered fritillary. Special concern wildlife include cavity-nesters,

Figure 28. Critical landscape habitats within the Upper Delaware River Valley and Kittatinny Ridge conservation zone, as identified through the Landscape Map (v2).



colonial waterbirds, interior forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub/open field birds, reptiles, amphibians, mollusks, and rare damselflies and dragonflies.

The contiguous forest of the ridges in this region is critical habitat for forest-dwelling bats, bobcats, cavity-nesters, migratory raptors and passerines, and forest-nesting passerines. Due to the proximity of known hibernacula, the forests of this zone likely provide summer foraging and roosting habitat for Indiana bats. The forests provide summer foraging habitat for timber rattlesnakes while rocky outcroppings within the forest provide basking and gestating habitat. Eastern box turtles and northern copperheads are also forest-dwelling wildlife inhabiting this zone. The forested wetlands support wood turtles, Fowler's toads, Jefferson salamanders, long-tailed salamanders, marbled salamanders, northern spring salamanders, and silver-bordered fritillaries. The Delaware River's floodplain forest is habitat for bald eagles, colonial waterbirds, and scrub-shrub birds, and provides critical stopover habitat for migrating birds. The diverse wetlands support bog and spotted turtles, colonial waterbirds, freshwater wetland birds, scrub-shrub/open field birds, bald eagles, special concern amphibians, and rare damselflies and dragonflies. The clear mountain streams support some of the state's most robust wood turtle and native trout populations. Tables S9 – S15 identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of Upper Delaware River Valley and Kittatinny Ridge

Table S9. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Reptiles				
Bog turtle		X		X
Mollusks				
Dwarf wedgemussel	X***			
Insects				
American burying beetle♦			X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
***Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table S10. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Allegheny woodrat***				X
Bobcat		X		X
Birds				
American bittern		X		
Bald eagle		X		X
Northern goshawk				X
Northern harrier			X	
Pied-billed grebe		X		
Peregrine falcon		X		X
Red-shouldered hawk				X
Vesper sparrow			X	

State Endangered Species (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Reptiles				
Timber Rattlesnake				X
Mollusks				
Brook floater	X**			
Green floater	X**			
Insects				
Appalachian grizzled skipper			X***	

** Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
***Only historic records exist. Species believed to be extirpated within this zone.
X: Species occurs within the identified habitat.

Table S11. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night-heron		X		
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Wood turtle			X	X
Amphibians				
Long-tailed salamander		X		X
Mollusks				
Tidewater mucket	X**			
Yellow lampmussel	X**			
Insects				
Silver-bordered fritillary		X		X

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S12. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Mammals				
Eastern small-footed bat				X**
Eastern red bat				X**
Silver-haired bat				X**
Hoary bat				X**
Long-tailed (Rock) shrew				X
Southern bog lemming		X	X	X
Birds				
Acadian flycatcher				X
American golden-plover		X		
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blackburnian warbler				X
Black-throated blue warbler				X
Black-throated green warbler				X
Blue-headed vireo (Solitary vireo)				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Birds (continued)				
Canada warbler				X
Cerulean warbler				
Chimney swift		X	X	X
Chuck-will's-widow				X
Cliff swallow		X	X	
Common nighthawk		X	X	X
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Golden-winged warbler				X
Gray catbird			X	X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		
Hooded warbler				X
Horned lark			X	
Indigo bunting			X	
Kentucky warbler				X
Least bittern		X		
Least flycatcher				X
Louisiana waterthrush				X
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Sharp-shinned hawk				X
Spotted Sandpiper		X		
Veery				X
Whip-poor-will				X
Willow flycatcher				X
Winter wren				X
Wood thrush				X
Worm-eating warbler				X
Yellow-bellied sapsucker				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle		X	X	X
Northern copperhead				X
Eastern hognose snake				X
Eastern ribbon snake		X	X	
Spotted turtle		X		
Amphibians				
Fowler's toad				X
Jefferson salamander				X
Marbled salamander				X
Northern spring salamander		X		X
Mollusks				
Creeper	X***			
Insects				
Northern metalmark		X		X
Extra-striped snaketail	X			X
New England bluet		X		X
Clubtail dragonfly	X			X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Fish				
American brook lamprey*	X			
Bridle shiner	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter
**Potential presence.
***Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S13. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock		X	X	X
Canada goose (Atlantic population)	X	X		
Wood duck	X	X		X
Virginia rail		X		
Fish				
Brook trout*	X			

*Species is an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table S14. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Cutlips minnow	X
Margined madtom	X
Northern hogsucker	X
Shield darter	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table S15. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X	X	
Fish				
Brown trout*	X			
Rainbow trout*	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Upper Delaware River Valley and Kittatinny Ridge

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The Upper Delaware River Valley and Kittatinny Ridge Zone remains one of the most rural areas in the state, with a large portion in public ownership. The greatest threats to wildlife include habitat fragmentation, degradation, and loss due to unsustainable and unscientific silviculture practices, and development that is occurring on privately owned land. Forest passerines, raptors and bobcats require large, contiguous forest stands. Cavity-nesters require large standing hollow trees for nesting. Disturbance and encroachment from recreational activities on public lands and waters can affect nesting bald eagles and other raptors, and timber rattlesnakes. A limited amount of grassland and scrub-shrub bird habitat occurs primarily along the Delaware River in the northwest portion of this zone that is threatened by changing agricultural practices, development, and reversion of fields to forest. Increased development often results in declining water quality, added pressure on groundwater resources, and the introduction of invasive plants. Inadequate wetland protection through the regulatory process affects bog turtles, amphibians, colonial waterbirds, and freshwater wetland birds. Declining water quality, invasive species, and dam construction impact mussel, and nongame fish and wild trout populations. The bioaccumulation of contaminants threatens bald eagles and other raptors. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of forest and forested wetlands as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife as the primary goal for this zone. Included in this group are such species or suites as the bobcat, Indiana and other forest-dwelling bats, the barred owl, red-shouldered hawk, northern goshawk, interior forest passerines, cavity nesting birds, the timber rattlesnake, and wood turtle.
- Identify, protect, maintain, enhance, and restore critical wetland habitats as identified by the Landscape Project for freshwater wetland birds, bog turtles, long-tailed salamanders, vernal pool breeders, special concern reptiles and amphibians, rare damselflies and dragonflies, and silver-bordered fritillaries.
- Identify, protect, maintain, enhance, and restore critical riverine habitat and water quality to preserve aquatic ecosystems, particularly for dwarf wedgemussels and other special concern mollusks, wood turtles, nongame fish, and rare damselflies and dragonflies that rely on high water quality.
- Identify, protect, maintain, enhance, and restore important grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height) as identified by the Landscape Project for grassland birds and scrub-shrub/open field birds. Due to the relative scarcity of grassland habitat,

this is a secondary priority for this zone. Grassland habitat should not be created at the expense of forest habitat in this zone.

- Inventory, determine distribution, and monitor fish and wildlife of greatest conservation need in the Upper Delaware River Valley and Kittatinny Ridge zone.
- Prevent, stabilize, and reverse declines of interior-forest species (primarily) including passerines and raptors, timber rattlesnakes, bobcats, forest-dwelling bats, special concern reptiles and amphibians, riparian and aquatic species such as rare freshwater mussels, freshwater wetland birds, special concern fish species, grassland and scrub-shrub wildlife populations of birds, rare dragonflies and damselflies, and butterfly and moth species of conservation concern.
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Identify and protect hibernation sites for Indiana bat and other winter resident bat species within New Jersey.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Skylands Regional Landscape stakeholders during a meeting held on January 10, 2007 (see *Attachment G*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern. *(Conserve wildlife – invasives)*
2º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive vegetation. restoring natural stream flows, re-vegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*

Priority	Conservation Actions (continued)
2º	Enhance targeted habitats for cavity-nesters, forest passerines, freshwater wetland birds and woodland raptors through the use of best management practices. *(Agriculture – land management; Silviculture – land management; Enhance habitat – private lands; Protect habitat – rare wildlife; Other practices – land management)*
Protect critical forest and forested wetland habitats identified in the Landscape Project	
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical high quality core forests (forest area >90 meters from the forest edge) and maintain species information in the Biotics database. Preserve and protect core forests through: • Regulations, land acquisition, and incentive programs for forest-dependent breeding species: forest-interior passerines and bobcats (≥ 10 hectares or 24.7 acres of core forest), forest raptors (≥ 100 hectares or 247 acres of contiguous forest), timber rattlesnakes (if unknown foraging habitat, a minimum of 1 ½ mile radius surrounding known den locations or 4,521 acres), and Indiana bats (≥ 6.8 hectares or 17 acres of contiguous forest) per the Forest Management Guidelines for Species of Conservation Concern in New Jersey. • Preservation efforts focused on area- and disturbance-sensitive breeding species in core forests located at least 2,500 meters from major highways. • Prevention of activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). • Identification of habitats adjacent to core forests that can be preserved and/or managed to increase the total size of forest habitat. • Collaboration with land managers, forest stewards, and private landowners to develop and implement best management practices *(Protect habitat – Landscape Project; Silviculture – land management))*
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, timber rattlesnakes, cerulean warblers, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create future barred owl and red-shouldered hawk habitat. • Canopy of 10-50% should be maintained at known timber rattlesnake dens and basking areas, and a canopy of >50% in foraging areas (these limits are generally naturally-occurring due to rocky and talus substrates). • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*

Priority	Conservation Actions (continued)
Protect critical wetland habitats identified in the Landscape Project	
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, northern goshawk, long-eared owl, and barred owl), forest-interior songbirds (cerulean warbler, Louisiana waterthrush, Canada warbler, and winter wren), bobcats, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat –private lands)*
2º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species. *(Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify and best management practices to maintain wetlands with snags of dead trees for red-headed woodpeckers and other cavity-nesters. *(Protect habitat – development, sprawl; Silviculture – land management)*
2º	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
Protect critical riverine habitats for aquatic/ wetland/riparian species.	
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish, mussels)*
2º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
Protect critical grassland and scrub-shrub habitats identified in the Landscape Project	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core grassland habitats, assess their condition for nesting grassland birds, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for mowing, conversion to warm-season grasses) strategies to maintain and enhance large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats, assess their condition for nesting birds (golden-winged warbler and woodcock), butterflies, moths, odonates, and other scrub-shrub species and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create interspersed scrub-shrub habitat in a grassland matrix. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed through public education and incentive programs. Increase the number of acres converted from existing hay and/or row crops to warm season grass fields, where appropriate, using landowner incentive programs. Evaluate effectiveness of delayed mowing between warm season grass fields and cool season hay fields for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. *(Protect habitat – humans; Enhance habitat –private lands)*

Priority	Conservation Actions (continued)
1º	Increase the effective size and connectivity of grasslands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of grasslands and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies. Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Target 2,000 hectare (7.7 sq. mi.) regions. Grassland habitats are limited within this zone and the primary area of opportunity for maintaining and managing these habitats is along the Delaware River within the Delaware Water Gap NRA. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Research different management techniques to understand the appropriateness of prescribed burning, mowing, brush-hogging, and other methods for maintaining suitable habitat for northeastern grassland birds and grassland dependent invertebrates. *(Conserve wildlife – rare wildlife)*
2º	Develop best management practices to guide public and private land managers in maintaining and enhancing grassland and other early succession habitats (scrublands and shrublands). *(Agriculture – land management; Other practices – land management)*
2º	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
Inventory, determine distribution, and monitor fish and wildlife	
1º	Research and evaluate effectiveness of water quality management practices on spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, dwarf wedgemussels, brook floaters, creepers, freshwater wetland birds, bog turtles, wild coldwater fisheries, and aquatic invertebrates, particularly those practices associated with permitting or mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Identify and research water quality parameters for spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, dwarf wedgemussels, brook floaters, creepers, freshwater wetland birds, bog turtles, wild coldwater fisheries, and aquatic invertebrates. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*

Priority	Conservation Actions (continued)
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas.
1º	Systematically survey the Delaware River Valley and Kittatinny Ridge Zone for all endangered and threatened species and selected species of special concern to track population and habitat trend data (e.g., woodland raptors to be surveyed every four years.) *(Monitor wildlife – long-term monitoring)*
1º	Determine population status and monitor trends of selected species of conservation concern in comparison to land use changes and alteration of habitat through long-term sampling and surveys. *(Monitor wildlife – long-term monitoring)*
1º	Conduct concentrated field sampling for listed or special concern fish species in areas indicated by Fish Track database queries and incorporate data into the Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
1º	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. *(Protect habitat – mussels; Monitor wildlife – long-term monitoring)*
1º	Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species. *(Protect habitat – Landscape Project)*
1º	Use GIS measures, other remote-sensing tools, and surveys to determine home range and habitat use for bobcats and wood turtles. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – Landscape Project)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry study during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats. *(Protect habitat – Landscape Project)*
1º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Trap Indiana bats during spring emergence from hibernacula and apply colored plastic bands to aid in recovery efforts during summer concentration surveys. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
2º	Continue to monitor reproductive success of eagles and protect nesting areas from human disturbance.
2º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, and common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of terrestrial wildlife, rare freshwater mussels, and rare freshwater fish species	
1º	Use GIS measures, other remote-sensing tools, and surveys to identify and best management practices to maintain, enhance, and/or protect critical habitats for dwarf wedgemussels, brook floaters, and creepers, longtail salamanders, and wood turtles, and assess their condition for maintaining populations. *(Protect habitat – mussels)*
1º	Assess specific threats to dwarf wedgemussel, brook floater and creeper, longtail salamanders, and wood turtle populations. Work with public and private landowners to protect, maintain, enhance, and restore habitat, as appropriate, through acquisition of, restoration of, and incentive programs focused on riparian habitats to maintain water quality and reduce siltation. *(Protect habitat – mussels, fish, sprawl; Enhance habitat – private lands)*
1º	Locate critical hibernating, gestating, and basking habitats for timber rattlesnakes along the Kittatinny Ridge through GIS measures, other remote-sensing tools, and surveys. Develop protection strategies to minimize human disturbance and illegal collecting at these sites. Work with public land managers to minimize recreational activities in critical areas. Enlist assistance from state and federal law enforcement personnel to monitor vulnerable areas. *(Protect habitat – Landscape Project; Protect wildlife - humans)*
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents and NWR officers, National Park Service law enforcement, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles, timber rattlesnakes), persecution (timber rattlesnakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management, and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation and controlling water levels in impoundments. *(Protect habitat – Landscape Project; Conserve Wildlife – rare wildlife; Enhance habitat – private lands)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, contaminants, water quality, competition by invasive plants and animals, and hybridization. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Protect species of greatest conservation need from exotic pathogen introduction or incident through rapid response; DFW to give priority attention to these species in planning or implementing a response. *(Conserve wildlife – rare wildlife, invasives)*
1º	Work with public and private landowners and managers with significant bog turtle, timber rattlesnake, wood turtle, longtail salamander, cavity-nester, freshwater wetland bird, grassland bird, woodland raptor, and interior-forest bird and scrub-shrub/open field bird populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
1º	Develop and implement habitat conservation goals that will meet the recovery needs of endangered and threatened wildlife populations that depend on forest habitats. These include guidelines for forest silviculture on public and private lands to enhance forest maturity and canopy, and replanting to reduce fragmentation. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands)*
1º	Protect timber rattlesnakes, bog and wood turtles, and special concern reptiles and amphibian populations from illegal collection through law enforcement and public education. *(Protect wildlife - humans)*
1º	Maintain and enhance reptile and amphibian populations, particularly those that are endangered because of illegal collection for the pet trade (bog and wood turtles, timber rattlesnakes) and those populations most susceptible to road mortality (known box turtle breeding locations near roads and amphibian breeding migration corridors). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*

Priority	Conservation Actions (continued)
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife – cats, subsidized predators)*
1º	Research the habitat requirements for species of conservation concern (e.g., forest passerines and woodland raptors, timber rattlesnakes, bobcats, and Indiana bats, where appropriate) and implement planned silviculture practices to enhance forests for these species and species suites. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices. *(Protect habitat – sprawl, development, Conserve wildlife – game species)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitat for silver-bordered fritillaries and manage for the proliferation of host vegetation and to retard succession where appropriate. *(Protect habitat – Landscape Project, rare wildlife)*
2º	Protect wildlife species of conservation concern, especially slow moving terrestrial species (e.g., reptiles, amphibians) and sensitive forest nesters (e.g., red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
2º	Develop research proposal to investigate the impact of land use patterns on woodland raptors and rare reptiles and amphibians. *(Protect habitat – sprawl; Corridors - sprawl)*

Priority	Conservation Actions (continued)
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Monitor wildlife – fish)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
Protect and enhance bald eagle habitat	
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Protect and enhance important and unique habitats	
1º	Federal, state, and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in the Delaware Water Gap National Recreation Area, Stokes State Forest, High Point State Park, Worthington State Forest, and adjacent wildlife management areas. *(Protect habitat – Landscape Project)*
1º	Federal and state agencies to maintain habitat suitable for area-sensitive species within the Delaware Water Gap National Recreation Area, Stokes State Forest, High Point State Park, Worthington State Forest, and adjacent wildlife management areas. *(Protect habitat - migratory birds, recreational vehicles, humans)*
2º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats within the Delaware Water Gap National Recreation Area, Stokes State Forest, High Point State Park, Worthington State Forest, and adjacent wildlife management areas. *(Protect habitat – migratory birds; Corridors – migratory birds)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.

Priority	Conservation Actions (continued)
Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and through the creation of a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical or biological control measures, or a combination of these, in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	Work with land management agencies to monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, Asian long-horned beetle, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
Identify and protect important hibernacula for wintering bats	
1º	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance. *(Monitor wildlife – long-term monitoring; Conserve wildlife - development)*

Priority	Conservation Actions (continued)
1º	Decrease or eliminate human disturbance and vandalism at hibernacula through increased patrols by the DFW, Bureau of Law Enforcement. *(Protect habitat - humans)*
2º	Assess the need for stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions. *(Protect habitat – humans)*
2º	Identify and implement appropriate protection strategies to maintain and enhance Indiana bat and other bat species' wintering habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat). (Protect habitat – humans)
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations. *(Protect habitat – fish)*
1º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Assess the impacts of changing water quality to native, wild, summer trout populations. *(Monitor wildlife– fish)*
Conserve and enhance native, wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Promote public education and awareness and wildlife conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter, and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies. *(Education – humans; Conserve wildlife – cats, subsidized predators)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop and maintain educational brochures and posters, and viewing and recreational opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, local, and non-governmental organization partners. *(Education – humans)*
2º	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is key to the successful control. *(Education – humans; Conserve wildlife - invasives)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of bald eagles, cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub/open field birds.
    - Utilize incentive programs that encourage the management of grassland, emergent wetland and scrub-shrub communities and bog turtle habitats and to protect water quality and riparian habitat in areas where rare mussels occur.

- Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of grassland, emergent wetland and scrub-shrub communities and bog turtle habitats.
- Develop and implement landowner incentives for providing, maintaining, and protecting summer and winter bat habitat.
- Develop/maintain cooperative relationships with private landowners with bog turtles on their land.
- Work with landowners to maintain/enhance riparian areas through stream bank restoration and planting native vegetation for dwarf wedgemussels, brook floaters, creepers, wood turtles, nongame fish, and rare damselflies and dragonflies.
- Work with landowners to protect water quality by minimizing use of fertilizers and pesticides for dwarf wedgemussels, brook floaters, creepers, wood turtles, nongame fish, coldwater fish and rare damselflies and dragonflies.
- Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
- In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

<u>Public</u>

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter (TNC), and NJ Conservation Foundation and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species
    - Involve Citizen Scientists in conservation projects, such as stream bank restoration.
    - Continue volunteer-based summer bat concentration surveys.

<u>Wildlife Professionals</u>

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Collaborate with the National Native Mussel Conservation Committee and other experts to develop best management practices for areas with listed and special concern species.
- Work with American Museum of Natural History to maintain existing NY/NJ freshwater mussel web site.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect bald eagle, cavity-nester, and woodland raptor nesting and foraging sites.
    - Protect and enhance riparian habitats.
    - Initiate and support eradication efforts for invasive plant species
- Consult with conservation organizations to develop educational programs.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA's Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) - NJ Field Office, and US Department of Agriculture (USDA), Natural Heritage Program (NHP) and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to protect bald eagle, cavity-nester, and raptor nesting and foraging sites.
    - DFW to develop a plan to protect sensitive bald eagle, bog turtle, timber rattlesnake, and wood turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bald eagle, bog turtle, timber rattlesnake, and wood turtle sites.
    - DFW to work with the DEP's Land Use Regulation Program (LURP) to protect sensitive areas around timber rattlesnake hibernacula.
    - DFW and conservation organizations to work with the LURP to protect and appropriately classify wetlands and vernal pools for special concern reptile and amphibian populations.
    - Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of bald eagles, cavity-nesters, forest passerines and raptors, and other forest-dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
    - DFW to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels and rare fish species.

  - DFW to work with the DEP's Division of Watershed Management to upgrade stream classifications in areas with rare mussels and wild trout populations.
  - DFW to develop specific conservation plans for special concern reptiles and amphibians on state lands.
  - DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
  - DFW will integrate results of vegetative structure in response to deer densities into deer management strategies within deer management zones.
  - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
  - DFW to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
  - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
  - DFW to work with the DEP's Office of Natural Lands Management, Natural Heritage Program (NHP) to develop mapping of significant vegetative communities to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the DEP only.
  - DFW to interact with other state agencies on operational, regulatory and land-use issues to ensure adequate consideration is given to protect coldwater fish resources.
  - DFW to determine groundwater recharge areas for bog turtle habitats and long-tailed salamander breeding sites with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with USFWS and other state and federal partners to implement American Woodcock Management Plan as appropriate.
  - DFW and DEP's Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs

such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, and local land trusts, and through mitigation.

- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Determine distribution, occurrence, and monitor bobcats.
- Routinely monitor abundance, productivity, distribution, and trends of bald eagles (annually), bog turtles, timber rattlesnakes, wood turtles, long-tailed salamanders, forest-dwelling bats, cavity-nesters, colonial waterbirds, forest passerines (2-4 years), freshwater wetland birds (2-4 years), and grassland bird, raptor, and scrub-shrub/open field bird communities (2-4 years), particularly in areas beyond the reach of the Breeding Bird Survey.
- Monitor contaminant levels that may impact bald eagle populations.
- Sponsor "Hawk Watches" for raptor monitoring during the fall migration.
- Monitor extant populations of dwarf wedgemussels, brook floaters and creepers.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project.
- Work with volunteers, private landowners, and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

2. Kittatinny Valley (or Great Valley)

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

The Kittatinny Valley lies in Sussex and Warren counties, between the Kittatinny Ridge and the northern extent of the Highlands Mountain ridges (Figure 29). This broad valley, in the Ridge and Valley physiographic province, contains fertile soils and has a long history of agricultural activity. The grassland habitat in the valley includes natural grasslands, croplands, pastures, old farm fields, hedgerows, and brush lots. The headwaters and associated freshwater wetlands of the Paulins Kill, Pequest, and Wallkill rivers are in the Kittatinny Valley. Old farm ponds, limestone fens, wet meadows, and swamps dot the landscape. Although grasslands and open habitats dominate much of the Kittatinny Valley, scattered, large parcels of forest remain interspersed throughout. The upland forest and forested wetland habitat includes stands of deciduous hardwood forest, scrublands and scrub-shrub wetlands, vernal pools, and red maple and hardwood swamps.

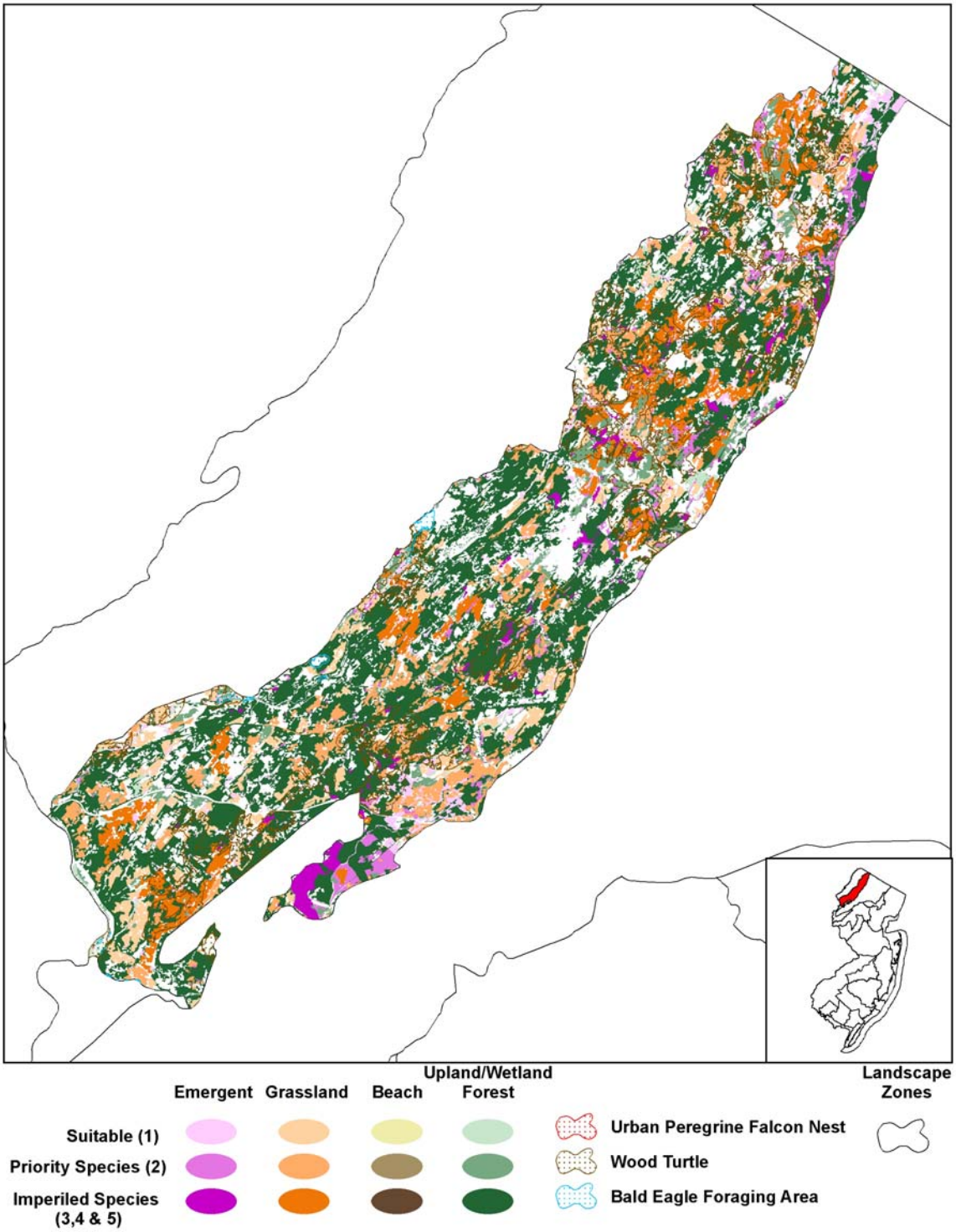
Conservation areas of opportunity in the Kittatinny Valley include Sussex Swamp Preserve, Kittatinny Valley and Swartswood state parks, Paulins Kill River, Whittingham, Columbia Lake, Beaver Brook and Musconetcong WMA's, Wallkill River NWR, and White Lake and Limestone Ridge natural areas.

b. Wildlife of Greatest Conservation Need

Kittatinny Valley habitats support five federal endangered or threatened, 14 state endangered, 16 state threatened, and 77 special concern and regional priority wildlife species, in addition to five game species of regional priority and three nongame fish species currently without state or regional status. The dwarf wedgemussel is federally endangered and the bog turtle is federally threatened. The state endangered species are the American bittern, northern goshawk, northern harrier, red-shouldered hawk, sedge wren, vesper sparrow, and blue-spotted salamander. The state threatened species are the barred owl, black-crowned night heron, bobolink, Cooper's hawk, grasshopper sparrow, long-eared owl, red-headed woodpecker, savannah sparrow, wood turtle, long-tailed salamander, eastern lampmussel, triangle floater, and silver-bordered fritillary. Special concern wildlife in the Kittatinny Valley are colonial waterbirds, forest passerines, freshwater wetland birds, grassland birds, scrub-shrub birds, reptiles, amphibians, and mollusks.

Migratory colonial waterbirds, songbirds, raptors, freshwater wetland birds, and waterfowl are funneled through the Kittatinny Valley to take refuge in the forest and wetland habitats. Forests, forested wetlands, and vernal pools also provide important habitat to a diverse group of reptiles and amphibians, including eastern box turtles, spotted turtles, wood turtles, blue-spotted salamanders, Fowler's toads, Jefferson salamanders, long-tailed salamanders, marbled salamanders, and northern spring salamanders. Due to the proximity of known hibernacula, the forests of this zone likely provide summer foraging and roosting habitat for Indiana bats. Bog turtles are found in the fens and wet meadows associated with pastures. The valley's grasslands

Figure 29. Critical landscape habitats within the Kittatinny Valley (or Great Valley) conservation zone, as identified through the Landscape Map (v2).



are critical to grassland birds and to foraging raptors. Dwarf wedgemussels persist in the Pequest River, their only known habitat in New Jersey. There are also eastern lampmussels, triangle floaters, and creepers in the valley's rivers and streams. One of the state's only two known Mitchell's satyr wetland habitats is in the Kittatinny Valley. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Kittatinny Valley

Table S16. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat		X		X**
Reptiles				
Bog turtle		X	X	X
Amphibians				
Dwarf wedgemussel	X***			
Insects				
American burying beetle♦			X	
Mitchell's satyr♦		X		X

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
** *Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table S17. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat				X
Birds				
American bittern		X		
Bald eagle		X		X
Northern harrier		X	X	
Pied-billed grebe		X		
Red-shouldered hawk				X
Sedge wren		X		
Short-eared owl		X		
Upland sandpiper			X	
Vesper sparrow			X	
Reptiles				
Timber rattlesnake				X
Amphibians				
Blue-spotted salamander				X
Mollusks				
Green floater	X**			
Insects				
Appalachian grizzled skipper ♦			X	

** Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer.
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table S18. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night heron		X		
Bobolink			X	
Cooper's hawk				X

State Threatened Species (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Grasshopper sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Wood turtle			X	X
Amphibians				
Long-tailed salamander		X		X
Mollusks				
Eastern lampmussel	X**			
Tidewater mucket	X**			
Triangle floater	X**			
Yellow lampmussel	X**			
Insects				
Silver-bordered fritillary				X

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer.
X: Species occurs within the identified habitat.

Table S19. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern small-footed bat				X**
Eastern red bat				X**
Hoary bat				X**
Silver-haired bat				X**
Long-tailed (Rock) shrew				X
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American golden-plover				
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Black-throated green warbler				X
Blue-winged warbler				X
Brown thrasher				X
Canada warbler				X
Cerulean warbler				X
Chimney swift			X	
Chuck-will's-widow				X
Cliff swallow		X	X	
Common barn owl		X	X	
Common nighthawk			X	
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl			X	X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Golden-winged warbler				X
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		
Hooded warbler			X	
Horned lark				

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Indigo bunting			X	
Kentucky warbler				
King rail		X		
Least bittern		X		
Least flycatcher				X
Louisiana waterthrush				X
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Veery				X
Whip-poor-will				X
Willow flycatcher				X
Wood thrush				X
Worm-eating warbler				X
Yellow-bellied sapsucker				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle		X	X	X
Eastern hognose snake			X	
Eastern ribbon snake		X	X	
Northern copperhead				X
Spotted turtle		X		
Amphibians				
Fowler's toad				X
Jefferson salamander				X
Marbled salamander				X
Northern spring salamander		X		X
Mollusks				
Creeper	X***			
Insects				
A noctuid moth (*Cucullia alfarata*)			X	
New England bluet	X	X		
Northern metalmark		X		X
Pitcher plant borer moth		X		
Schweitzer's buckmoth				X
Fish				
American brook lamprey*	X			
Bridle shiner	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter
**Potential presence.
***Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer.
X: Species occurs within the identified habitat.

Table S20. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock		X		X
Canada goose (Atlantic population)	X	X		
Wood duck	X	X		X
Virginia rail		X		
Fish				
Brook trout*	X			

*Species is an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table S21. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Cutlips minnow	X
Margined madtom	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table S22. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		
Fish				
Brown trout*	X			
Rainbow trout*	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Kittatinny Valley

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Habitat loss, degradation, and fragmentation are a concern for wildlife in the Kittatinny Valley. The fragmentation and alteration of grasslands due to development, agricultural practices, and the reversion of fields and scrub-shrub habitats to forest threaten habitat specialist grassland birds and scrub-shrub/open field birds. Deleterious invasive plants and groundwater degradation have altered the fens and wet meadows inhabited by bog turtles. Efforts must be made to protect unique habitats and plant and animal communities such as White Lake Natural Area and Whittingham Natural Area. Beaver, although generally considered beneficial, may be of local concern when their dams flood bog turtle habitat. Road mortality and illegal collection threaten

bog and wood turtles, and over-collection has seriously reduced or possibly extirpated Mitchell's satyr populations. Dam construction and water quality degradation threaten riverine habitats that support mussel, nongame fish and native trout populations. Development continues to fragment the existing large forest parcels inhabited by area-sensitive species of raptors and passerines. New Jersey's burgeoning white-tailed deer population poses a significant threat to forest health and forest regeneration. Deer damage coupled with anthropogenic factors has severely impacted much of New Jersey's remaining public and private natural lands. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore critical wetland habitats as identified by Landscape Project for pied-billed grebes, American bitterns, sedge wrens, colonial waterbirds, bog turtles, blue-spotted salamanders, long-tailed salamanders, vernal pool breeders, special concern reptiles and amphibians, Mitchell's satyrs, rare damselflies and dragonflies, and silver-bordered fritillaries. Maintain connectivity between habitats to insure the long-term viability of these species.
- Identify, protect, enhance, and/or restore important riverine habitats and water quality to preserve aquatic ecosystems for dwarf wedgemussels, special concern mollusks, wood turtles, special concern reptiles and amphibians, nongame fishes, native, wild trout populations and rare damselflies and dragonflies.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of critical grassland habitat (areas with >75 % herbaceous and <25% woody vegetation) as identified by the Landscape Project for upland sandpipers, vespers, grasshoppers and savannah sparrows, bobolinks, special concern grassland birds, wintering raptors and special concern butterflies and moths.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of forest and forested wetlands as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife. These include such species or suites as Indiana and other forest-dwelling bats, bobcats, red-shouldered hawks, barred owls, interior forest passerines, cavity nesting birds and timber rattlesnakes. Maintain connectivity of these habitats to ensure the long-term viability of area-sensitive species.
- Identify, protect, maintain, enhance, and restore important scrub-shrub communities (areas with >25% woody vegetation <20 feet in height).
- Inventory, determine distribution, and monitor wildlife (including nongame fish species) of greatest conservation need in the Kittatinny Valley zone.
- Prevent, stabilize, and reverse declines of primarily grassland, scrub-shrub, and wetland/ riverine species including grassland passerines and raptors, special concern dragonflies, damselflies, butterflies and moths, rare and special concern reptiles and amphibians, colonial waterbirds, special concern fish species, and forest-interior species such as woodland raptors, bobcats, and forest-dwelling bats including the federal endangered Indiana bat.
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Protect and enhance important and unique natural communities.

- Assess large-scale habitat change (every five to 10 years).
- Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Preserve the ecological quality and integrity of vernal pool communities.
- Prevent illegal collection of rare reptiles including bog and wood turtles.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Skylands Regional Landscape stakeholders during a meeting held on January 10, 2007 (see *Attachment G*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern. *(Conserve wildlife – invasives)*
2º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, re-vegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2º	Enhance targeted habitats for cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, scrub-shrub birds and woodland raptors through the use of best management practices. *(Agriculture – land management; Silviculture – land management; Enhance habitat – private lands; Protect habitat – rare wildlife; Other practices – land management)*

Priority	Conservation Actions
Protect critical wetland habitats identified in the Landscape Project	
1º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat –private lands)*
2º	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan. *(Conserve wildlife – invasives)*
Protect critical riverine habitats for aquatic/ wetland/riparian species.	
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish, mussels)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*

Priority	Conservation Actions (continued)
Protect critical grassland habitats identified in the Landscape Project	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for mowing, conversion to warm-season grasses) strategies to maintain and enhance large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Consolidate adjacent grassland fields, through the elimination of hedgerows, fences, or tree lines, in areas where open land occupies a considerable amount of the surrounding landscape and grassland management can be identified as a reasonable management alternative. *(Agriculture – land management)*
1º	Increase the effective size and connectivity of grasslands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of grasslands and scrub-shrub habitats and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies. Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Target 2,000 hectare (7.7 sq. mi.) regions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Encourage landowners to delay mowing to allow grassland-dependent species to breed through public education and incentive programs. Increase the number of acres converted from existing hay and/or row crops to warm season grass fields, where appropriate, using landowner incentive programs. Evaluate effectiveness of delayed mowing between warm season grass fields and cool season hay fields for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. *(Protect habitat – humans; Enhance habitat –private lands)*
1º	Identify (through GIS and other remote sensing tools and surveys) and enhance grassland habitat for source populations of grassland birds and American kestrels. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
2º	Work with Bureau of Land Management to identify appropriate sites on public lands to maintain and enhance grasslands. Establish mowing schedules, control exotic, invasive vegetation, and establish stands of native warm season grasses on 30 - 50 acres per year within the Landscape region. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project, migratory birds)*

Priority	Conservation Actions (continued)
2º	Research different management techniques to understand the appropriateness of prescribed burning, mowing, brush-hogging, and other methods for maintaining suitable habitat for northeastern grassland birds and grassland dependent invertebrates. *(Conserve wildlife – rare wildlife)*
2º	Develop best management practices to guide public and private land managers in maintaining and enhancing grassland and other early succession habitats (scrublands and shrublands). *(Agriculture – land management; Other practices – land management)*
Protect critical forest and forested wetland habitats identified in the Landscape Project	
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, timber rattlesnakes, cerulean warblers, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create future barred owl and red-shouldered hawk habitat. • Canopy of 10-50% should be maintained at known timber rattlesnake dens and basking areas, and a canopy of >50% in foraging areas (these limits are generally naturally-occurring due to rocky and talus substrates). • Take action to minimize loss of older growth forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*

Priority	Conservation Actions (continued)
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
Protect important scrub-shrub communities	
1º	Work with public and private land managers to maintain and enhance scrub-shrub habitats where appropriate. *(Conserve wildlife – development; Silviculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats, assess their condition for nesting birds (golden-winged warbler and woodcock), and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create interspersed scrub-shrub habitat in a grassland matrix. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify scrub-shrub areas within or adjacent to large forest parcels that have the potential to provide habitat for early succession/scrub-shrub species such as the golden-winged warbler, woodcock and ruffed grouse while protecting the integrity of the forest for area-sensitive species. Manage areas within large forest parcels to provide and maintain scrub-shrub habitats. *(Silviculture – land management; Conserve wildlife – game species)*
2º	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Maintain existing grassland and scrub-shrub habitats and work to establish new grasslands or scrub-shrub habitats along utility-line rights-of-way. *(Conserve wildlife – development; Silviculture – land management)*
Inventory and monitor endangered, threatened, and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas.

Priority	Conservation Actions (continued)
1º	Systematically survey the Kittatinny Valley Zone for all endangered and threatened species and selected species of special concern to develop baseline data and track population and habitat trends. Incorporate species occurrence data into the Biotics database. *(Monitor wildlife – long-term monitoring; Protect habitat – Landscape Project)*
1º	Research and evaluate effectiveness of water quality management practices on spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, dwarf wedgemussels, eastern lampmussels, triangle floaters, freshwater wetland birds, bog turtles, nongame fish, native trout, and aquatic invertebrates, particularly those practices associated with permitting and mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Identify and research water quality parameters for spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, dwarf wedgemussels, eastern lampmussels, triangle floaters, freshwater wetland birds, bog turtles, nongame fish, native trout, and aquatic invertebrates. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species. *(Protect habitat – Landscape Project)*
1º	Use GIS, other remote sensing tools, and surveys to identify critical habitats for dwarf wedgemussels and other special concern mollusks, wood turtles, longtail salamanders, special concern reptiles and amphibians, nongame fishes, silver-bordered fritillaries, and special concern damselflies and dragonflies and assess their condition for maintaining populations. Work with the Bureau of Freshwater fisheries to identify critical nongame fish and native trout habitat. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – mussels, Landscape Project, fish; Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote-sensing tools, and surveys to determine home range territories and habitat use for bobcats, and to identify important travel corridors. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – Landscape Project)*
1º	Conduct systematic surveys for woodland raptors every four years to monitor population and habitat trends. *(Monitor wildlife – long-term monitoring)*
1º	Determine population status and monitor trends of species of conservation concern in comparison to land use changes and alteration of habitat through long-term sampling and surveys. *(Monitor wildlife – long-term monitoring)*
1º	Conduct concentrated field sampling for listed or special concern species at areas indicated by Fish Track Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*

Priority	Conservation Actions (continued)
1º	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites for Indiana bats and other wintering bat species; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance. *(Monitor wildlife – long-term monitoring; Conserve wildlife - development)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry studies during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats. *(Protect habitat – Landscape Project)*
1º	Conduct telemetry studies during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Continue to monitor reproductive success of eagles and protect nesting areas from human disturbance. *(Monitor wildlife – long-term monitoring)*
2º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks) and eastern screech-owls. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. *(Protect habitat – mussels; Monitor wildlife – long-term monitoring)*
2º	Trap Indiana bats during spring emergence from hibernacula and apply colored plastic bands to aid in recovery efforts during summer concentration surveys. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of wildlife and rare freshwater fish species	
1º	Use GIS measures, other remote-sensing tools, and surveys to identify, and best management practices to maintain, enhance, and/or protect critical habitats for dwarf wedgemussels, brook floaters, creepers, and longtail salamanders and assess their condition for maintaining populations. *(Enhance habitat –private lands) (Protect habitat – humans)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, contaminants, water quality, competition by invasive plants and animals, and hybridization. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife–cats, subsidized predators)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	Maintain and enhance reptile and amphibian populations, particularly those that are endangered because of illegal collection for the pet trade (bog and wood turtles) and those populations most susceptible to road mortality (known box turtle breeding locations near roads and amphibian breeding migration corridors). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians, and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
1º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to pro*vid*e travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management, and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation and controlling water levels in impoundments. *(Protect habitat – Landscape Project; Conserve Wildlife – rare wildlife; Enhance habitat – private lands)*
1º	Research the habitat requirements for species of conservation concern (e.g., forest passerines and raptors, bobcats, and Indiana bats) and implement planned silviculture to enhance forests for these species and species suites. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife – cats, subsidized predators)*
1º	Assess specific threats to dwarf wedgemussel, triangle floater and Eastern lampmussels, nongame fishes, native trout, wood turtles, longtail salamanders, and other target species. Work with public and private landowners to protect, maintain, enhance, and restore habitat, as appropriate, through acquisition of, restoration of, and incentive programs focused on riparian habitats to maintain water quality and reduce siltation. *(Protect habitat – mussels, fish, sprawl; Enhance habitat – private lands)*
1º	Decrease or eliminate human disturbance and vandalism at bat hibernacula through increased patrols by the DFW, Bureau of Law Enforcement. *(Protect habitat - humans)*
1º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices. *(Protect habitat – sprawl, development, Conserve wildlife – game species)*
2º	Trap and relocate beaver when their dams threaten bog turtle and/or rare plant populations. *(Protect habitat – Landscape Project)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitat for silver-bordered fritillaries and manage for the proliferation of host vegetation and to retard succession where appropriate. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Investigate causes of decline and landscape-scale habitat requirements of American kestrels and barn owls; identify the most effective methods to restore and enhance habitat and provide nest cavities (standing dead biomass and nest boxes). *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
2º	Identify groundwater recharge areas for blue-spotted salamander breeding sites and incorporate the sites into the Biotics database. *(Conserve wildlife – rare wildlife)*
2º	Develop research proposal to investigate the impact of land use patterns on woodland raptors and rare reptiles and amphibians. *(Protect habitat – sprawl; Corridors - sprawl)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Assess the need for stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions. *(Protect habitat – humans)*
2º	Identify and implement appropriate protection strategies to maintain and enhance Indiana bat and other bat species' wintering habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat). *(Protect habitat – humans)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
Protect and enhance important and unique habitats	
1º	Federal, state, and local agencies will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in White Lake and the Johnsonburg Preserve. *(Protect habitat – Landscape Project)*
1º	Federal and state agencies,, non-government organizations, and private landowners to protect and manage critical bog turtle sites on public and private lands within the Wallkill River National Wildlife Refuge and the Wallkill River, Paulinskill, and Pequest watersheds through best management practices, incentive programs, and land acquisition. *(Protect habitat – Landscape Project, humans; Enhance habitat – private lands)*
1º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to protect and enhance the unique natural communities that support endangered species and species of conservation concern at White Lake, Johnsonburg and Blair Creek preserves, Lake Owassa's Bear Swamp, Crooked Swamp, and Glover's Pond Natural Heritage Priority Site. *(Protect habitat – humans, development, sprawl; Enhance habitat – private lands)*

Priority	Conservation Actions (continued)
2º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats within the Wallkill River National Wildlife Refuge and Wallkill River Watershed. *(Protect habitat – migratory birds; Corridors – migratory birds)*
2º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to continue to support the protection of the large wetland complex of the Wallkill River National Wildlife Refuge, Wallkill River Watershed, White Lake, Johnsonburg and Blair Creek preserves, Lake Owassa's Bear Swamp, Crooked Swamp, and Glover's Pond and enhance endangered plant and unique natural communities, through incentive programs, best management practices, and increased law enforcement to minimize disturbance at these sites. *(Protect habitat - humans, development, sprawl)*
Protect and enhance bald eagle habitat	
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*

Priority	Conservation Actions (continued)
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and through the creation of a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
2º	Work with land management agencies to survey and monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, Asian long-horned beetle, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer (e.g., "earn-a-buck"). *(Conserve wildlife – deer)*
Preserve integrity of vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Work with public agencies and private landowners to protect vernal pools and maintain optimal biological buffers (beyond regulatory requirements) to preserve the integrity of vernal pools and the surrounding upland habitat for vernal pool dependent amphibians. Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize pool buffers and prevent erosion. *(Protect habitat – sprawl; Enhance habitat –private lands)*

Priority	Conservation Actions (continued)
Prevent illegal collection of rare reptiles	
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents and NWR officers, National Park Service law enforcement, US Army Natural Resources Managers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles, timber rattlesnakes), persecution (timber rattlesnakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
2º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles), persecution (timber rattlesnake), and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations. *(Protect habitat – fish)*
1º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Assess the impacts of changing water quality to native, wild, summer trout populations. *(Monitor wildlife– fish)*
Conserve and enhance native, wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Promote public education and viewing opportunities	
1º	Develop brochures and posters about management practices for the public and for private landowners with significant bog turtle, wood turtle, cavity-nester, freshwater wetland bird, grassland bird, forest passerine, woodland raptor, and scrub-shrub/open field bird populations. *(Education – humans)*

Priority	Conservation Actions (continued)
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter, and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies.
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, local, and non-governmental organization partners. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub/open field birds.
    - Utilize incentive programs that encourage the management of grassland and scrub-shrub communities and bog turtle habitats and to protect water quality and riparian habitat in areas where rare mussels occur.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of grassland and scrub-shrub communities and bog turtle habitats.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer and winter bat habitat.
    - Develop/maintain cooperative relationships with private landowners with bog turtles on their land.
    - Work with landowners to maintain/enhance riparian areas through stream bank restoration and planting native vegetation for dwarf wedgemussels, eastern lampmussels and triangle floaters, wood turtles, nongame fish, and rare damselflies and dragonflies.
    - Work with landowners to protect water quality by minimizing use of fertilizers and pesticides for dwarf wedgemussels, eastern lampmussels and triangle floater, wood turtles, nongame fish, native trout, and rare damselflies and dragonflies.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for moth and butterfly species
    - Involve Citizen Scientists in conservation projects, such as stream bank restoration.
    - Continue volunteer-based summer bat concentration surveys.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Collaborate with the National Native Mussel Conservation Committee and other experts to develop best management practices for areas with listed and special concern species.
- Work with American Museum of Natural History to maintain existing NY/NJ freshwater mussel web site.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect cavity-nester and woodland raptor nesting and foraging sites.
    - Protect and enhance riparian habitats.
    - Initiate and support eradication efforts for invasive plant species.
- Consult with conservation organizations to develop educational programs.
- Encourage the use of the Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA's NRCS, USFWS - NJ Field Office, and USDA, and the DCA, Office of Smart Growth to protect, enhance, and create habitats; and protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to protect cavity-nester and raptor nesting and foraging sites.
    - DFW to develop a plan to protect sensitive bog turtle and wood turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle and wood turtle sites.
    - DFW and conservation organizations to work with the DEP's Land Use Regulation Program (LURP) to protect and appropriately classify wetlands for special concern reptile and amphibian populations.
    - DFW to work with the DEP's Division of Watershed Management to upgrade stream classifications in areas with rare mussels, nongame fishes and native and/or wild trout populations.
    - Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, raptors, and

other forest-dwelling species, and freshwater wetland birds on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds. Protect important and unique communities of plants and animals such as White Lake and Big Spring Natural Areas.

- DFW to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels and rare fish species.
- DFW to develop specific conservation plans for special concern reptiles and amphibians on state lands.
- DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
- DFW will integrate results of vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW to work with the DEP's Office of Natural Lands Management, Natural Heritage Program (NHP) to develop mapping of significant vegetative communities to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
- DFW to determine groundwater recharge areas for bog turtle habitats, breeding sites for blue-spotted salamander and long-tailed salamander, and vernal pools with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
- DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with USFWS and other state and federal partners to implement American Woodcock Management Plan as appropriate.
- DFW and DEP's Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.

  - DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Periodically monitor abundance, productivity, distribution, and trends of bog turtles, wood turtles, blue-spotted salamanders, long-tailed salamanders, forest-dwelling bats, cavity-nesters, colonial waterbirds, forest passerines (2-4 years), freshwater wetland birds (2-4 years), and grassland bird, raptor, and scrub-shrub/open field bird communities (2-4 years), particularly in areas beyond the reach of the Breeding Bird Survey.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project.
- Monitor extant sites with dwarf wedgemussels, eastern lampmussels, and triangle floaters.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

3. Northern Highlands

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

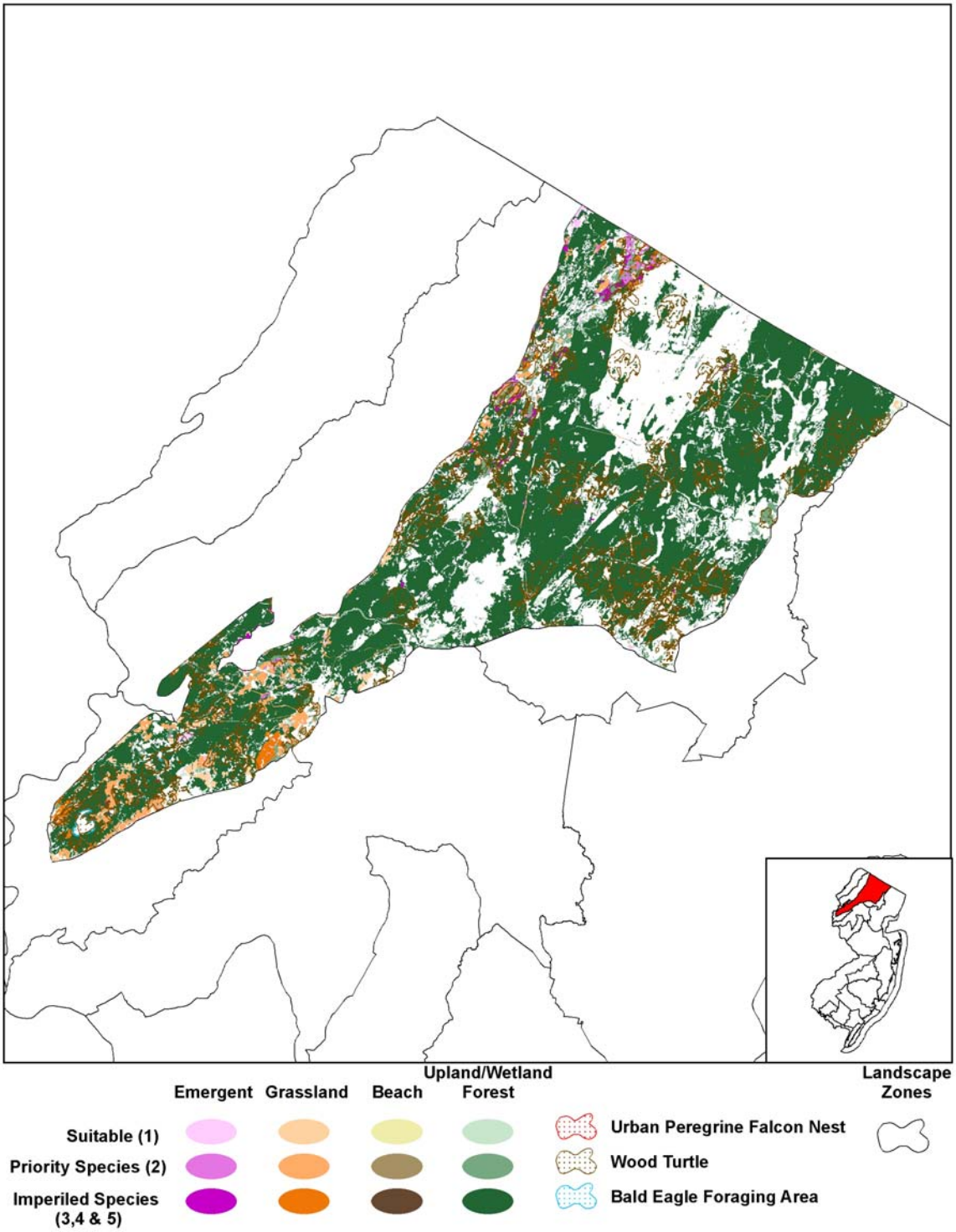
The Northern Highlands Zone is located in portions of Sussex, Passaic, Bergen, Morris, and Warren counties, in the Highlands physiographic province (Figure 30). It starts along the New York state border and follows the higher elevations of the Highland ridges from northeast to southwest. The Northern Highlands include the Wawayanda Plateau, the Wyanokie Highlands, the Ramapo Mountains, Upper Greenwood Lake, Greenwood Lake, and the Wanaque Reservoir at the northern end. Traveling south it includes Green Pond Mountain, Sparta Mountain, Allamuchy Mountain, the Jenny Jumps and Scott's, or Montana Mountain at its southwest terminus.

The Northern Highlands are characterized by expansive mountain ranges and sculpted valleys with contiguous forest cover of mixed oak-hardwood forest and forested wetlands with patches of rocky outcroppings. This area of the Highlands physiographic province includes the headwaters of the Musconetcong, Pequannock, Rockaway, South Branch of the Raritan River, Wallkill rivers, and Pohatcong Creek. It also has many glacial lakes, beaver-created wetlands, fens, wet meadows, shrub wetlands, and vernal pools. Abandoned iron mines in the region, particularly the Hibernia and Mt. Hope mines, are critical hibernacula for bats in New Jersey. Narrow utility corridors and small agricultural fields are the primary grassland habitats in the Northern Highlands.

The Wawayanda Plateau includes two conservation opportunity areas, Wawayanda State Park and Abram S. Hewitt State Forest on Bearfort Mountain. The Wyanokie Highlands include Wanaque WMA, Longpond Ironworks State Park, Norvin Green State Forest, and Sterling Forest. The Ramapo Mountains include Ringwood State Park, Ramapo Mountain Forest, and Campgaw Mountain Reservation. Additional areas of conservation opportunity to the south include Hamburg Mountain, Weldon Brook, Sparta Mountain, Rockaway River, Berkshire Valley, Pequest and Wildcat Ridge WMA's, Mahlon Dickerson Reservation, Allamuchy Mountain and Jenny Jump state parks, and the extensive holdings of the Morris County Park Commission.

These areas include large patches of uninterrupted northern hardwood forest, including mixed oak-hardwoods and hemlock ravines. Emergent and forested wetlands are plentiful throughout this zone. There are also numerous vernal pools, glacially formed spring-fed lakes, and beaver ponds.

Figure 30. Critical landscape habitats within the Northern Highlands conservation zone, as identified through the Landscape Map (v2).



b. Wildlife of Greatest Conservation Need

The Northern Highlands support three federal endangered and threatened, 13 state endangered, 14 state threatened, and 81 special concern and regional priority wildlife species, in addition to six game species of regional priority and three nongame fish species currently without state or regional status. The federal endangered species is the Indiana bat and the two federal threatened species are the bog turtle and bald eagle. The state-endangered species are the Allegheny woodrat, bobcat, American bittern, northern goshawk, northern harrier, pied-billed grebe, red-shouldered hawk, sedge wren, vesper sparrow and timber rattlesnake. The state-threatened wildlife includes the barred owl, long-eared owl, Cooper's hawk, red-headed woodpecker, bobolink, grasshopper sparrow, savannah sparrow, wood turtle, long-tailed salamander and silver-bordered fritillary. Special concern wildlife are cavity-nesters, colonial waterbirds, forest passerines, freshwater wetland birds, raptors, scrub-shrub/open field birds, reptiles, and amphibians.

The expansive forest cover of the Northern Highlands is important habitat for raptors, particularly because of the decline of forest habitat throughout other parts of northern New Jersey. Bobcats were successfully reintroduced to the region in the late 1970s as part of a recovery program and persist in un-fragmented forests and forested wetlands throughout the Northern Highlands. Cavity-nesters, forest passerines, nesting great blue herons, wood turtles, eastern box turtles, northern copperheads, Fowler's toads, and marbled salamanders also inhabit the northern hardwood forest and hemlock ravines. Rocky outcroppings provide important seasonal habitat for timber rattlesnakes. Scrub-shrub/open field birds inhabit the shrubby edge of the forests. Wetlands in the Northern Highlands support pied-billed grebes, American bitterns, bog turtles, spotted turtles, and silver-bordered fritillaries. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Northern Highlands

Table S23. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X
Reptiles				
Bog turtle		X		X
Insects				
American burying beetle♦			X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
♦Only historic records exist. Species believed to be extirpated.

X: Species occurs within the identified habitat.

Table S24. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Allegheny woodrat				X
Bobcat				X
Birds				
American bittern		X		
Bald eagle				X
Northern goshawk				X
Northern harrier		X	X	

State Endangered Species (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Pied-billed grebe		X		
Red-shouldered hawk				X
Sedge wren		X		
Vesper sparrow			X	
Reptiles				
Timber rattlesnake				X
Mollusks				
Green floater	X**			
Insects				
Arogos skipper			X	

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer.
X: Species occurs within the identified habitat.

Table S25. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Black-crowned night-heron		X		
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Wood turtle			X	X
Amphibians				
Long-tailed salamander		X		
Mollusks				
Tidewater mucket	X**			
Yellow lampmussel	X**			
Insects				
Silver-bordered fritillary			X	

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer.
X: Species occurs within the identified habitat.

Table S26. Nongame Species of Conservation Concern

Common Name	Water	Emergent Wetlands	Grasslands	Forest and Forested Wetlands
Mammals				
Eastern small-footed bat				X
Eastern red bat				X**
Hoary bat				X**
Silver-haired bat				X
Long-tailed (Rock) shrew				X
Southern bog lemming			X	X
Birds				
Acadian flycatcher				X
American golden-plover		X		
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blackburnian warbler				X
Black-throated blue warbler				X
Black-throated green warbler				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Emergent Wetlands	Grasslands	Forest and Forested Wetlands
Birds (continued)				
Blue-headed vireo (Solitary vireo)				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Canada warbler				X
Cerulean warbler				X
Chimney swift			X	
Chuck-will's-widow				X
Cliff swallow			X	
Common nighthawk			X	
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Golden-winged warbler				X
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		
Hooded warbler				X
Indigo bunting			X	
Least bittern		X		
Least flycatcher				X
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Sharp-shinned hawk				X
Spotted Sandpiper		X		
Veery				X
Whip-poor-will				X
Willow flycatcher				X
Winter wren				X
Wood thrush				X
Worm-eating warbler				X
Yellow-bellied sapsucker				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle		X	X	X
Eastern ribbon snake			X	X
Eastern hognose snake			X	X
Northern copperhead				X
Spotted turtle		X		

Nongame Species of Conservation Concern (continued)

Common Name	Water	Emergent Wetlands	Grasslands	Forest and Forested Wetlands
Amphibians				
Carpenter frog		X		
Fowler's toad				X
Jefferson salamander				X
Marbled salamander				X
Northern spring salamander		X		X
Insects				
Two-spotted skipper		X		
Harris's checkerspot		X		
New England bluet	X	X		
Schweitzer's buckmoth				X
Fish				
American brook lamprey*	X			
Bridle shiner	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table S27. Game Species of Regional Priority

Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock		X		
Canada goose (Atlantic population)	X	X		
Wood duck	X	X		X
Virginia rail		X		
Fish				
Brook trout*	X			

*Species is an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table S28. Fish Species

Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Cutlips minnow	X
Ironcolor shiner	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table S29. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		
Fish				
Brown trout*	X			
Rainbow trout*	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Northern Highlands

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Development in northern New Jersey presents the greatest threat to the remaining large tracts of contiguous forest cover that is critical to many of the wildlife species found in the Northern Highlands Zone. Bobcats are vulnerable to encroachment and diseases that are indirectly associated with human presence. Silviculture practices contribute to forest fragmentation, direct disturbance and habitat alteration that can impact forest species. A decline in suitable habitat threatens cavity-nesters, scrub-shrub birds, bog turtles, and wood turtles. Encroachment from recreational activities impacts a variety of species, including timber rattlesnakes and Indiana bats. Freshwater wetland birds, bog turtles, spotted turtles, wood turtles, carpenter frogs, Fowler's toads, and marbled salamanders are vulnerable to water quality degradation from non-point source pollution and habitat loss associated with poorly planned development. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of forest and forested wetlands as identified by Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife. These include such species or suites as bobcats, Indiana and other forest-dwelling bats, barred owls, red-shouldered hawks, northern goshawks, interior forest passerines, cavity nesting birds, timber rattlesnakes, and wood turtles. Maintaining large contiguous tracts of forest is the primary goal in the Northern Highlands Region.
- Identify, protect, maintain, enhance, and restore critical wetland habitats as identified by the Landscape Project for freshwater wetland birds, bog turtles, long-tailed salamanders, vernal pool breeders, special concern reptiles and amphibians, rare damselflies and dragonflies, and silver-bordered fritillaries.

- Identify, protect, maintain, enhance, and restore critical riverine and riparian habitats and water quality to preserve aquatic ecosystems for wood turtles, rare mollusks, nongame fish, and rare damselflies and dragonflies.
- Identify, protect, maintain, enhance, and restore important grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub (areas with >25% woody vegetation <20 feet in height) habitats as identified by Landscape Project for grassland birds and scrub-shrub/open field birds. Maintaining and enhancing scrub-shrub habitats is an important goal in this zone. Grassland habitats within this zone are relatively small and isolated and are therefore, considered to be of secondary importance within the Northern Highlands. Grassland habitat should not be created at the expense of forest habitat in this zone.
- Inventory, determine distribution, and monitor wildlife (including nongame fish species) of greatest conservation need in the Northern Skylands Zone.
- Prevent, stabilize, and reverse declines of interior-forest species (primarily) including passerines and raptors, timber rattlesnakes, bobcats, forest-dwelling bats, special concern reptiles and amphibians, riparian and aquatic species such as rare freshwater mussels, freshwater wetland birds, special concern fish species, grassland and scrub-shrub wildlife populations of birds, rare dragonflies and damselflies, and butterfly and moth species of conservation concern.
- Preserve the ecological quality and integrity of vernal pool communities.
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Identify and protect hibernation sites for Indiana bat and other winter resident bat species within New Jersey.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Skylands Regional Landscape stakeholders during a meeting held on January 10, 2007 (see *Attachment G*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern. *(Conserve wildlife – invasives)*
2º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, re-vegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2º	Enhance targeted habitats for cavity-nesters, forest passerines, freshwater wetland birds, and woodland raptors through the use of best management practices. *(Agriculture – land management; Silviculture – land management; Enhance habitat – private lands; Protect habitat – rare wildlife; Other practices – land management)*

Priority	Conservation Actions (continued)
Protect critical forest and forested wetlands habitats identified in the Landscape Project	
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, timber rattlesnakes, cerulean warblers, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create future barred owl and red-shouldered hawk habitat. • Canopy of 10-50% should be maintained at known timber rattlesnake dens and basking areas, and a canopy of >50% in foraging areas (these limits are generally naturally-occurring due to rocky and talus substrates). • Take action to minimize loss of older growth forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, northern goshawk, long-eared owl, barred owl), forest-interior songbirds (cerulean warbler, Louisiana waterthrush, Canada warbler, winter wren), bobcats, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*

Priority	Conservation Actions (continued)
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*
Protect critical wetland habitats identified in the Landscape Project	
1º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat – private lands)*
2º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species. *(Conserve wildlife – rare wildlife)*
2º	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
Protect critical riverine and riparian habitats identified in the Landscape Project	
1º	Protect water quality and aquatic-dependent species by appropriately designating Category One waters. *(Protect habitat – rare wildlife, fish, mussels)*
2º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
Protect critical grassland and scrub-shrub habitats identified in the Landscape Project	
2º	Develop best management practices to guide public and private land managers in maintaining and enhancing grassland and other early succession habitats (scrublands and shrublands). *(Agriculture – land management; Other practices – land management)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify scrub-shrub areas within or adjacent to large forest parcels that have the potential to provide habitat for early succession/scrub-shrub species such as the golden-winged warbler, woodcock, and ruffed grouse while protecting the integrity of the forest for area-sensitive species. Manage areas within large forest parcels to provide and maintain scrub-shrub habitats. *(Silviculture – land management; Protect habitat – migratory birds)*
2º	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Research different management techniques to understand the appropriateness of prescribed burning, mowing, brush-hogging, and other methods for maintaining suitable habitat for northeastern grassland birds and grassland dependent invertebrates. *(Conserve wildlife – rare wildlife)*
Inventory and monitor endangered, threatened and special concern wildlife	
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas.
1º	Systematically survey the Northern Highlands Zone for all endangered and threatened species and selected species of special concern to develop baseline data and track population and habitat trends. Incorporate species occurrence data into the Biotics database. *(Monitor wildlife – long-term monitoring; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Conduct concentrated field sampling for listed or special concern species at areas indicated by Fish Track Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
1º	Determine population status and monitor trends of species of conservation concern in comparison to land use changes and alteration of habitat through long-term sampling and surveys. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, rare mollusks, freshwater wetland birds, nongame fish, native, wild trout, and aquatic invertebrates. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Research and evaluate effectiveness of water quality management practices on spotted turtles, wood turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, rare mollusks, freshwater wetland birds, nongame fishes, native, wild trout, and aquatic invertebrates, particularly those practices associated with permitting and mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote-sensing tools, and surveys to determine home range territories and habitat use for bobcats, and to identify important travel corridors. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – Landscape Project)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry studies during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats. *(Protect habitat – Landscape Project)*
1º	Conduct telemetry studies during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Continue to monitor reproductive success of eagles and protect nesting areas from human disturbance. *(Monitor wildlife – long-term monitoring)*
2º	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks), northern saw-whet owls, and eastern screech-owls. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Trap Indiana bats during spring emergence from hibernacula and apply colored plastic bands to aid in recovery efforts during summer concentration surveys. *(Monitor wildlife – long-term monitoring)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of wildlife, rare freshwater mussels, and rare freshwater fish species	
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, contaminants, water quality, competition by invasive plants and animals, and hybridization. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Develop and implement habitat conservation goals that will meet the recovery needs of endangered and threatened wildlife populations that depend on forest habitats. These include guidelines for forest silviculture on public and private lands to enhance forest maturity and canopy, and replanting to reduce fragmentation. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands)*
1º	Protect species of greatest conservation need from exotic pathogen introduction or incident through rapid response; DFW to give priority attention to these species in planning or implementing a response. *(Conserve wildlife – rare wildlife, invasives)*
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents and NWR officers, National Park Service law enforcement, US Army Natural Resources Managers, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles, timber rattlesnakes), persecution (timber rattlesnakes), and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical hibernating, gestating, and basking habitats for timber rattlesnakes along the Northern Highlands. Minimize human disturbance and illegal collecting at these sites through increased law enforcement presence. Work with public land managers to minimize recreational activities in critical areas. Enlist assistance from state and federal law enforcement personnel to monitor vulnerable areas. *(Protect habitat –humans)*
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical riparian and riverine habitats and assess their suitability for raptors and passerines, wood turtles, longtail salamanders, special concern reptiles and amphibians, nongame fishes, native, wild trout, and special concern damselflies and dragonflies and assess their condition for maintaining populations. Develop protection strategies to maintain and enhance populations and habitat (e.g., innovative public and private partnerships, provide private landowner incentives and develop cooperative agreements to protect and manage habitat). *(Protect habitat – Landscape Project, fish)*
1º	Assess specific threats to nongame fishes, wood turtles, longtail salamanders, and other target species. Work with public and private landowners to restore, maintain, enhance, and protect habitat, as appropriate, through acquisition of, restoration of, and incentive programs focused on riparian habitats to maintain water quality and reduce siltation. *(Protect habitat – Landscape Project, fish, mussels)*
1º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
1º	Maintain and enhance reptile and amphibian populations, particularly those that are endangered because of illegal collection for the pet trade (bog and wood turtles, timber rattlesnakes) and those populations most susceptible to road mortality (known box turtle breeding locations near roads and amphibian breeding migration corridors). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management, and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation, and controlling water levels in impoundments. *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife; Enhance habitat – private lands)*
1º	Research the habitat requirements for species of conservation concern (e.g., forest passerines and woodland raptors, timber rattlesnakes, bobcats, and Indiana bats) and implement planned silviculture to enhance forests for these species and species suites. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*
1º	Work with public and private landowners and manager with significant bog and wood turtle, timber rattlesnake, longtail salamander, cavity-nester, freshwater wetland bird, grassland bird, woodland raptor, and scrub-shrub/open field bird populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife – cats, subsidized predators)*
1º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices. *(Protect habitat – sprawl, development, Conserve wildlife – game species)*
2º	Develop research proposal to investigate the impact of land use patterns on woodland raptors and rare reptiles and amphibians. *(Protect habitat – sprawl; Corridors - sprawl)*

Priority	Conservation Actions (continued)
2º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Monitor wildlife – fish)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
Preserve the ecological quality and integrity of vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Work with public agencies and private landowners to maintain optimal biological buffers (beyond regulatory requirements) to preserve the integrity of vernal pools and the surrounding upland habitat for vernal pool dependent amphibians. Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – sprawl; Enhance habitat –private lands)*
2º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species. *(Conserve wildlife – rare wildlife)*
Protect and enhance important and unique habitats	
1º	Federal, state and local agencies will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in the Mahlon Dickinson Reservation, Rockaway River Wildlife Management Area (WMA), Sparta Mountain WMA, Ringwood State Park, and the US Army Armament Research Development and Engineering Center (Picatinny Arsenal). *(Protect habitat – Landscape Project)*
2º	Local government, with assistance from private landowners and the NJ DEP, Natural Heritage Program will map significant natural communities in the Newark (Pequannock) Watershed. *(Protect habitat – Landscape Project)*
2º	Work with Department of Defense to protect critical forest and unique talus habitats on Picatinny Arsenal. *(Protect habitat – humans, development, sprawl)*

Priority	Conservation Actions (continued)
2º	Work with state and local governments to protect critical forests and unique talus habitats in Ringwood State Park, Lake Denmark, the Beech Road Ridge Priority Site, and surrounding areas. Increase law enforcement to minimize disturbance in sensitive areas. *(Protect habitat – humans, development, sprawl)*
Protect and enhance bald eagle habitat	
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and through the creation of a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife – deer)*
2º	Work with land management agencies to survey for and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, Asian long-horned beetle, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Work with the Bureau of Wildlife Management to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration. *(Conserve wildlife – deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer (e.g., "earn-a-buck."). *(Conserve wildlife – deer)*
Identify and protect important hibernacula for wintering bats	
1º	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance. *(Monitor wildlife – long-term monitoring; Conserve wildlife - development)*
1º	Decrease or eliminate human disturbance and vandalism at hibernacula through increased patrols by the DFW, Bureau of Law Enforcement. *(Protect habitat - humans)*
2º	Assess the need for stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions. *(Protect habitat – humans)*

Priority	Conservation Actions (continued)
2º	Identify and implement appropriate protection strategies to maintain and enhance Indiana bat and other bat species' wintering habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat). *(Protect habitat – humans)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations. *(Protect habitat – fish)*
1º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Assess the impacts of changing water quality to native, wild, summer trout populations.. *(Monitor wildlife– fish)*
Conserve and enhance native, wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Promote public education and awareness and wildlife conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans)*
1º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter, and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies. *(Education – humans; Conserve wildlife – cats, subsidized predators)*

Priority	Conservation Actions (continued)
1º	Develop educational programs, brochures, and posters for the public regarding tolerance and protection of timber rattlesnakes and their habitat. *(Protect wildlife – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*
2º	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, freshwater wetland birds, raptors, and scrub-shrub/open field birds.
    - Utilize incentive programs that encourage the management of grassland and scrub-shrub communities and the conservation of bog turtles, and encourage the protection of water quality and riparian habitat in areas where rare mussels occur.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of grassland and scrub-shrub communities and bog turtles.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer and winter bat habitat.

- Develop/maintain cooperative relationships with private landowners with bog turtles on their land.
- Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
- In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species
    - Involve Citizen Scientists in conservation projects, such as stream bank restoration.
    - Continue volunteer-based summer bat concentration surveys.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect cavity-nester and woodland raptor nesting and foraging sites.
    - Protect and enhance riparian habitats.
    - Initiate and support eradication efforts for invasive plant species.
- Consult with conservation organizations to develop educational programs.
- Encourage the use of Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, USDA's NRCS, USFWS - NJ Field Office, and the DCA, Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to develop a plan to protect sensitive bog turtle, timber rattlesnake, and wood turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle, timber rattlesnake, and wood turtle sites.
    - DFW to work with the Office of State Planning and local and municipal planners to protect sensitive areas around timber rattlesnake hibernacula.
    - DFW and conservation organizations to work with the DEP's Land Use Regulation Program (LURP) to protect and appropriately classify wetlands for special concern reptile and amphibian populations.
    - Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and freshwater wetland birds on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
    - DFW to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels and rare fish species.
    - DFW to develop specific conservation plans for special concern reptiles and amphibians on state lands.
    - DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
    - DFW will integrate results of vegetative structure in response to deer densities into deer management strategies within deer management zones.
    - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
    - DFW to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
    - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
    - DFW to work with the DEP's Office of Natural Lands Management, Natural Heritage Program (NHP) to develop mapping of significant vegetative communities to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.

  - DFW to determine groundwater recharge areas for bog turtle habitats and vernal pools with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with USFWS and other state and federal partners to implement American Woodcock Management Plan as appropriate.
  - DFW and DEP's Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to work with the State Planning Commission, the Office of Smart Growth and local governments to protect critical wildlife habitat and unique communities through the designation of Special Resource Areas within the State Development and Redevelopment Plan.
  - DFW to work with the newly created Highlands Council to implement the Landscape Project within the Highlands Region. Work with the Council to designate "no build zones" in the preservation area that are identified as critical habitat on the Landscape maps. Help to identify conservation areas in the surrounding planning area based on Landscape maps.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, and local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Determine distribution, occurrence, and monitor bobcats.
- Annually monitor abundance, productivity, distribution, and trends of bog turtles, timber rattlesnakes, wood turtles, forest-dwelling bats, cavity-nesters, colonial waterbirds, forest passerines (2-4 years), freshwater wetland birds (2-4 years), and raptor and scrub-shrub/open field bird communities (2-4 years), particularly in areas beyond the reach of the Breeding Bird Survey.

- Sponsor “Hawk Watches” for raptor monitoring during the fall migration.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

4. Delaware and Musconetcong River Valleys

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

The Delaware and Musconetcong River Valleys Zone lies in southern Warren, extreme northern Hunterdon and a very small portion of western Morris counties (Figure 31). Broad river valleys with very fertile soils characterize this zone. Agriculture is the zone's dominant land use. The grassland habitat in these valleys includes natural grasslands, croplands, pastures, old farm fields, utility rights-of-ways, hedgerows, and scrub-shrub dominated areas. Old farm ponds, wet meadows, and swamps infrequently dot the landscape. Scattered, highly fragmented forest parcels remain interspersed throughout. The upland forest and forested wetland habitat includes stands of deciduous hardwood forest, conifer plantations, scrub-shrub uplands and wetlands, vernal pools, and red maple and hardwood swamps. Scattered riparian forests provide important habitat for resident and migratory species.

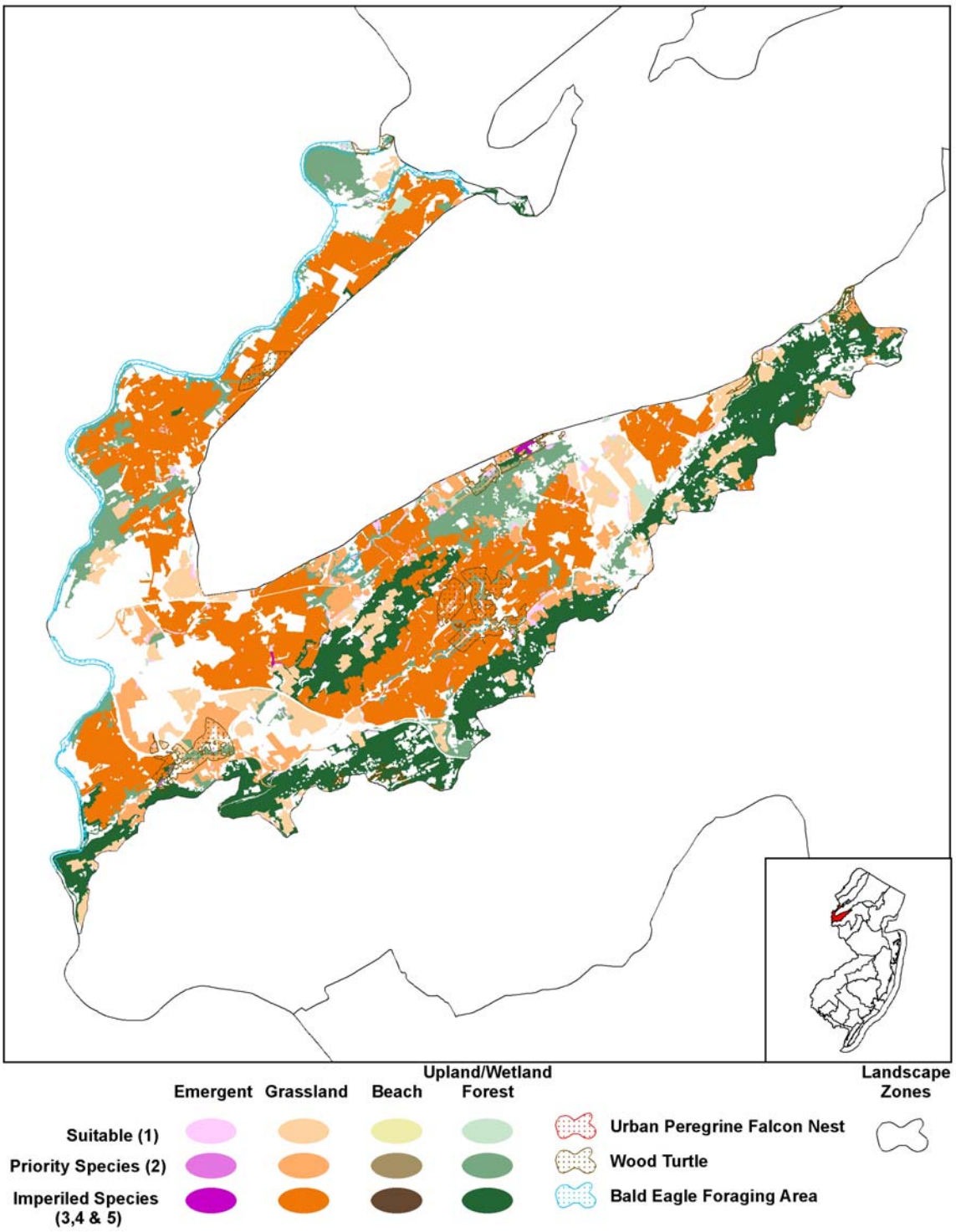
Publicly and privately owned conservation areas of opportunity in the Delaware and Musconetcong River Valleys Zone are scarce. However, important areas of opportunity include Musconetcong and Pohatcong Creek WMA's and the Alpha Grasslands in Pohatcong Township.

b. Wildlife of Greatest Conservation Need

The Delaware and Musconetcong River Valley habitats support two federal threatened, five state endangered, 10 state threatened, and 50 special concern and regional priority wildlife species, in addition to seven game species of regional priority and four nongame fish species currently without state or regional status. The federal threatened species include the bog turtle and American burying beetle. The state-endangered species are the northern harrier, upland sandpiper, short-eared owl, vesper sparrow and green floater. State threatened species include the barred owl, bobolink, Cooper's hawk, grasshopper sparrow, red-headed woodpecker, savannah sparrow, wood turtle, long-tailed salamander, eastern lampmussel, and triangle floater. Special concern wildlife in the Delaware and Musconetcong river valleys are colonial waterbirds, forest passerines, freshwater wetland birds, grassland birds, scrub-shrub birds, reptiles, amphibians, and mollusks.

The Delaware River serves as a migration route for colonial waterbirds, songbirds, raptors, freshwater wetland birds, and waterfowl. These species take refuge in the floodplain forests and wetland habitats adjacent to the Delaware River. Forests, forested wetlands, and vernal pools are important habitats for a diversity of reptiles and amphibians, including eastern box turtles, spotted turtles, wood turtles, Fowler's toads, long-tailed salamanders, marbled salamanders, and northern spring salamanders. Bog turtles are found in the wet meadows associated with pastures. The valley's grasslands are important to grassland birds and winter-foraging raptors. Tables S30 – S36 identify the species of greatest conservation need within this zone.

Figure 31. Critical landscape habitats within the Delaware and Musconetcong River Valleys conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Delaware and Musconetcong River Valleys

Table S30. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana Bat		X		X**
Reptiles				
Bog turtle		X		
Insects				
American burying beetle♦			X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table S31. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Northern harrier		X	X	
Short-eared owl			X	
Upland sandpiper			X	
Vesper sparrow			X	
Mollusks				
Green floater	X**			

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S32. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Wood turtle			X	X
Amphibians				
Long-tailed salamander		X		
Common Name	**Water**	**Wetlands**	**Grasslands**	**Forests and Forested Wetlands**
Mollusks				
Tidewater mucket	X**			
Yellow lampmussel	X**			

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S33. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Mammals				
Eastern small-footed bat				X**
Eastern red bat				X
Hoary bat				X**
Silver-haired bat				X**
Long-tailed (Rock) shrew				X
Southern bog lemming			X	X
Birds				
Acadian flycatcher				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Birds (continued)				
American golden-plover		X		
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Blue-winged warbler				X
Brown thrasher				X
Cerulean warbler				X
Chimney swift			X	
Cliff swallow		X	X	
Common barn owl			X	
Common nighthawk				X
Eastern kingbird				X
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		
Indigo bunting			X	
Kentucky warbler				X
Least flycatcher				X
Northern flicker				X
Prairie warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Sharp-shinned hawk				X
Spotted Sandpiper		X		
Veery				X
Willow flycatcher				X
Wood thrush				X
Worm-eating warbler				X
Yellow-bellied sapsucker				X
Yellow-billed cuckoo				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle		X	X	X
Amphibians				
Carpenter frog		X		
Fowler's toad				X
Northern spring salamander		X		
Insects				
Clubtail dragonfly	X			X
Fish				
American brook lamprey*	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table S34. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock		X		X
Canada goose (Atlantic population)	X	X		
Virginia rail		X		
Northern bobwhite quail			X	X
Wood duck	X	X		X
Fish				
Brook trout*	X			

*Species is an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table S35. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Cutlips minnow	X
Margined madtom	X
Shield darter	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table S36. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		
Fish				
Brown trout*	X			
Rainbow trout*	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Delaware and Musconetcong River Valleys

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The extensive grassland habitats of the Delaware and Musconetcong River Valleys are vulnerable to losses, as agricultural lands are highly valued by developers. Considerable habitat loss, fragmentation, and degradation have already impacted grassland wildlife in the region. Riparian habitats are in need of protection throughout the zone. Water quality degradation, human encroachment, illegal collection, disease and harmful invasive exotic plants also threaten wildlife. Over-browsing by deer in areas closed to hunting is negatively impacting habitat for

many species. In addition, these areas become more susceptible to invasion by non-indigenous plants. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of critical grassland habitat (areas with >75 % herbaceous and <25% woody vegetation) as identified by the Landscape Project for upland sandpipers, vesper, grasshopper and savannah sparrows, bobolinks, special concern grassland birds, wintering raptors, and special concern dragonflies. Grasslands are a major feature of this zone.
- Identify, protect, enhance, and restore important riverine habitats and water quality to preserve aquatic ecosystems for special concern mollusks, wood turtles, special concern reptiles and amphibians, nongame fishes, native, wild trout populations, and rare damselflies and dragonflies.
- Identify, protect, maintain, enhance, and restore the remaining large contiguous tracts of forest and forested wetlands as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife. These include such species or suites as the Cooper's hawk, red-headed woodpecker, interior forest passerines and cavity nesting birds, and forest-dwelling bats. Large forest tracts are relatively scarce in this zone and efforts to maintain remaining large tracts is important.
- Identify, protect, maintain, enhance, and restore critical wetland habitats as identified by the Landscape Project for bog turtles, wood turtles, long-tailed salamanders, vernal pool breeders, special concern reptiles and amphibians, and rare damselflies and dragonflies.
- Inventory, determine distribution, and monitor wildlife (including nongame fish species) of greatest conservation need.
- Prevent, stabilize, and reverse declines of primarily grassland and scrub-shrub species including grassland passerines and raptors, special concern dragonflies, damselflies, butterflies and moths, rare and special concern reptiles and amphibians, wetland/ riverine species including colonial waterbirds, special concern fish species, and forest-interior species such as interior forest passerines, woodland raptors, forest-dwelling bats, and red-headed woodpeckers.
- Protect and enhance important and unique natural communities.
- Assess large-scale habitat change (every five to 10 years).
- Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Identify and protect hibernation sites for Indiana bat and other winter resident bat species within New Jersey.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Skylands Regional Landscape stakeholders during a meeting held on January 10, 2007 (see *Attachment G*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern. *(Conserve wildlife – invasives)*
2º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, re-vegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2º	Enhance targeted habitats for cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, scrub-shrub birds and woodland raptors, bog and wood turtles, and special concern mollusks. *(Agriculture – land management; Silviculture – land management; Enhance habitat – private lands; Protect habitat – rare wildlife; Other practices – land management)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify important winter foraging sites for short-eared owls and northern harriers. Work with public and private landowners and managers to protect and maintain suitable wintering habitat through incentive programs, best management practices, and acquisition. *(Silviculture – land management; Agriculture – land management; Protect habitat – migratory birds)*
Protect critical grassland and scrub-shrub habitats identified in the Landscape Project	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for mowing, conversion to warm-season grasses) strategies to maintain and enhance large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*

Priority	Conservation Actions (continued)
1º	Consolidate adjacent grassland fields, through the elimination of hedgerows, fences, or tree lines, in areas where open land occupies a considerable amount of the surrounding landscape and grassland management can be identified as a reasonable management alternative. *(Agriculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats, assess their condition for nesting birds (golden-winged warbler and woodcock), and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create interspersed scrub-shrub habitat in a grassland matrix. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Increase the effective size and connectivity of grassland and scrub shrub habitats on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of grasslands and scrub-shrub habitats and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Identify and enhance grassland habitat for source populations of grassland birds and American kestrels. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
2º	Work with Bureau of Land Management to identify appropriate sites on public lands to maintain and enhance grasslands. Establish mowing schedules, control exotic, invasive vegetation, and establish stands of native warm season grasses on 30 - 50 acres per year within the Landscape region. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project, migratory birds)*
2º	Develop best management practices to guide public and private land managers in maintaining and enhancing grassland and other early succession habitats (scrublands and shrublands). *(Agriculture – land management; Other practices – land management)*
Protect critical riverine and riparian habitats	
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish, mussels)*
2º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*

Priority	Conservation Actions (continued)
2º	Identify and implement actions to protect, maintain, and/ or restore, riverine habitat, as appropriate, for target species. Actions can include acquisition, landowner incentives for protection and management, livestock fencing, no-mow riparian buffers, planting native vegetation in riparian zones to shade streams and control water temperatures. *(Agriculture – land management; Silviculture – land management; Corridors – migratory birds)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
Protect critical forest and forested wetland habitats identified in the Landscape Project	
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, cerulean warblers, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create future barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older growth forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*

Priority	Conservation Actions (continued)
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
Protect critical wetland habitats identified in the Landscape Project	
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimizing destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat – private lands)*
1º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan. *(Conserve wildlife – invasives)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas.
1º	Systematically survey this zone for all endangered and threatened species and selected species of special concern to track population and habitat trends. Incorporate species occurrence data into the Biotics database. *(Monitor wildlife – long-term monitoring; Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Conduct concentrated field sampling for listed or special concern species at areas indicated by Fish Track Database queries and incorporate data into Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
1º	Identify and research water quality parameters for spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders and rare mollusks. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Research and evaluate effectiveness of water quality management practices on spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, and rare mollusks, particularly those practices associated with permitting and mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Determine population status and monitor trends of species of conservation concern in comparison to land use changes and alteration of habitat through long-term sampling and surveys. *(Monitor wildlife – long-term monitoring)*
1º	Determine distribution of triangle floaters and other rare mollusks in the Musconetcong River and associated waterways through continued surveys and the use of GIS and other remote sensing tools. *(Monitor wildlife – long-term monitoring)*
1º	Use GIS, other remote sensing tools, and surveys to identify critical habitats for special concern mollusks, wood turtles, long-tail salamanders, special concern reptiles and amphibians, nongame fishes, and special concern damselflies and dragonflies and assess their condition for maintaining populations. Work with the Bureau of Freshwater Fisheries to identify critical nongame fish and native, wild trout habitat. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – mussels, Landscape Project, fish; Conserve wildlife – rare wildlife)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry studies during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats. *(Protect habitat – Landscape Project)*
1º	Conduct telemetry studies during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Trap Indiana bats during spring emergence from hibernacula and apply colored, plastic bands to aid in recovery efforts during summer concentration surveys. *(Monitor wildlife – long-term monitoring)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of wildlife and rare freshwater fish species	
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, contaminants, water quality, competition by invasive plants and animals, and hybridization. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management, and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation and controlling water levels in impoundments. *(Protect habitat – Landscape Project; Conserve Wildlife – rare wildlife; Enhance habitat – private lands)*
1º	Assess specific threats to nongame fishes, wood turtles, longtail salamanders, and other target species and take the necessary actions to restore, maintain, enhance, and protect habitat, as appropriate. Recommend Category One classification for streams supporting populations. Work with public and private landowners and managers to protect and manage riparian habitat to maintain water quality and reduce siltation. *(Conserve wildlife – rare wildlife; Protect habitat – fish, mussels)*

Priority	Conservation Actions (continued)
1º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads, sprawl; Protect habitat – roads, fish, mussels)*
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife – cats, subsidized predators)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Investigate causes of decline and landscape-scale habitat requirements of American kestrels and barn owls; identify the most effective methods to restore and enhance habitat and provide nest cavities (standing dead biomass and nest boxes). *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices. *(Protect habitat – sprawl, development, Conserve wildlife – game species)*

Priority	Conservation Actions (continued)
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Monitor wildlife – fish)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
Protect and enhance important and unique habitats	
1º	Work with private landowners adjacent to Alpha grasslands and the Garrision Road Priority Site to manage surrounding habitat for grassland species effectively increasing the size of suitable habitat through incentive programs and best management practices. *(Protect habitat – development, sprawl)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and through the creation of a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife – deer)*

Priority	Conservation Actions (continued)
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible. *(Evaluate restoration – deer; Conserve wildlife – deer, rare wildlife)*
2º	Work with land management agencies to survey for and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, Asian long-horned beetle, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer (e.g., "earn-a-buck"). *(Conserve wildlife – deer)*
2º	Work with the Bureau of Wildlife Management to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration. *(Conserve wildlife – deer)*
Identify and protect important hibernacula for wintering bats	
1º	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance. *(Monitor wildlife – long-term monitoring; Conserve wildlife - development)*
1º	Decrease or eliminate human disturbance and vandalism at hibernacula through increased patrols by the DFW, Bureau of Law Enforcement. *(Protect habitat - humans)*
2º	Assess the need for stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions. *(Protect habitat – humans)*
2º	Identify and implement appropriate protection strategies to maintain and enhance Indiana bat and other bat species' wintering habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat). *(Protect habitat – humans)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations. *(Protect habitat – fish)*
1º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Assess the impacts of changing water quality to native, wild, summer trout populations. *(Monitor wildlife– fish)*

Priority	Conservation Actions (continued)
Conserve and enhance native, wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Promote public education and awareness and wildlife conservation	
1º	Develop education materials describing management practices for public land managers and private landowners with significant bog turtle, wood turtle, cavity-nester, grassland bird, forest passerine, woodland raptor, and scrub-shrub/open field bird populations. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, local, and non-governmental organization partners. *(Education – humans)*

Priority	Conservation Actions (continued)
2º	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub/open field birds.
    - Utilize incentive programs that encourage the management of grassland and scrub-shrub communities and the conservation of bog turtles, and to protect water quality and riparian habitat in areas where rare mussels occur.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of grassland and scrub-shrub communities and bog turtles.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer and winter bat habitat.
    - Develop/maintain cooperative relationships with private landowners with bog turtles on their land.
    - Work with landowners for the long-term protection of rare mollusks.
    - Work with landowners to inventory their properties for the presence and severity of non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.

- Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
- Recruit North American Butterfly Association volunteers to conduct surveys for butterfly species.
- Involve Citizen Scientists in conservation projects, such as stream bank restoration.
- Continue volunteer-based summer bat concentration surveys.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Collaborate with the National Native Mussel Conservation Committee and other experts to develop best management practices for areas with listed and special concern species.
- Work with American Museum of Natural History to maintain existing NY/NJ freshwater mussel web site.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect cavity-nester and woodland raptor nesting and foraging sites.
    - Protect and enhance riparian habitats.
    - Initiate and support eradication efforts for invasive plant species
- Consult with conservation organizations to develop educational programs.
- Encourage the use of Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, NRCS, USFWS - NJ Field Office, and USDA, and the DCA, Office of Smart Growth to protect, enhance, and create habitats; and protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to protect cavity-nester and raptor nesting and foraging sites.
    - DFW to develop a plan to protect sensitive bog turtle and wood turtle sites from disturbance.
    - DFW share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle and wood turtle sites.

- DFW and conservation organizations to work with the DEP's Land Use Regulation Program to protect and appropriately classify wetlands for special concern reptile and amphibian populations.
- DFW to work with the DEP's Division of Watershed Management to upgrade stream classifications in areas with rare mussels.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, raptors, and other forest-dwelling species, and freshwater wetland birds on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance, and maintain habitats for grassland and scrub-shrub/open field birds.
- DFW to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels and rare fish species.
- DFW to develop specific conservation plans for special concern reptiles and amphibians on state lands.
- DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
- DFW will integrate results of vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW to work with the DEP's Office of Natural Lands Management, Natural Heritage Program to develop mapping of significant vegetative communities to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
- DFW to determine groundwater recharge areas for bog turtle habitats, breeding sites for special concern amphibians, and vernal pools with the Division of Water Quality and the NJ Geological Survey. ENSP to expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
- DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with USFWS and other state and federal partners to implement American Woodcock Management Plan as appropriate.

  - DFW and DEP's Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Periodically monitor abundance, productivity, distribution, and trends of bog turtles, wood turtles, forest-dwelling bats, cavity-nesters, colonial waterbirds, forest passerines (2-4 years), freshwater wetland birds (2-4 years), and grassland bird, raptor, and scrub-shrub/open field bird communities (2-4 years), particularly in areas beyond the reach of the Breeding Bird Survey.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project.
- Monitor extant sites with rare mollusks.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

5. Central Highlands

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

The Central Highlands is characterized by lower elevation mountain ranges and sculpted valleys with a forest cover of mixed oak-hardwood forest and forested wetlands with patches of rocky outcroppings. This area of the Highlands physiographic province (Figure 32) includes the headwaters of the Musconetcong, South Branch of the Raritan and Lamington rivers and Pohatcong Creek and has fewer wetlands, fens, wet meadows and scrub-shrub wetlands than the Northern Highlands Zone. Vernal pools are prevalent throughout this zone. Forests become more highly fragmented in the Central Highlands although some large tracts still persist and provide habitat for area-sensitive forest species, primarily forest passerines. Agricultural fields are prevalent throughout this zone and provide habitat for grassland birds and other early succession (grassland and scrub-shrub) wildlife. Abandoned iron mines exist throughout the region, and provide critical hibernacula for bats.

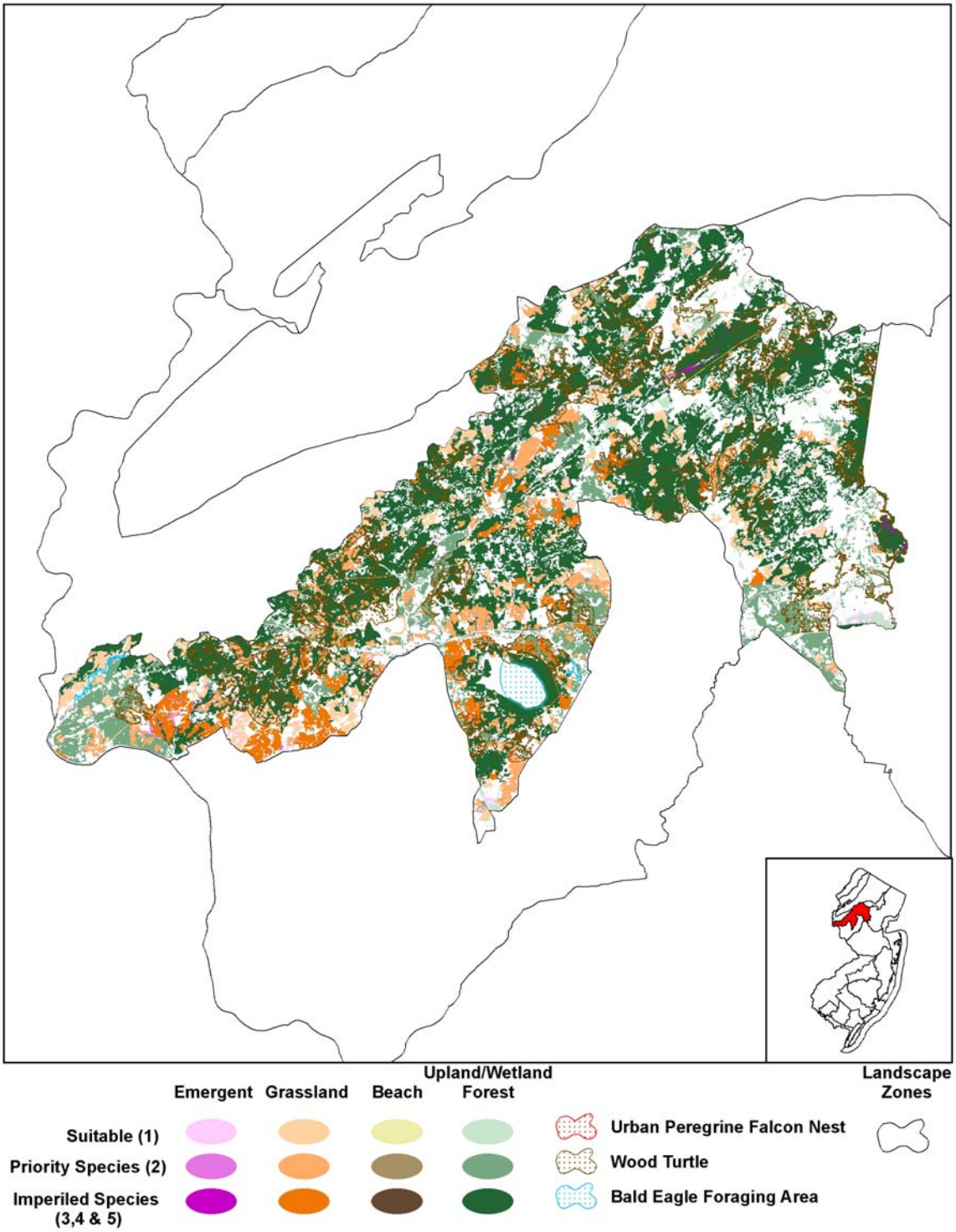
Conservation areas of opportunity in the Central Highlands include Black River WMA, Ken Lockwood Gorge WMA, Clinton WMA, Spruce Run Recreation Area, Round Valley Recreation Area, Voorhees State Park and Hacklebarney State Park, and the extensive holdings of the Hunterdon County Park System.

b. Wildlife of Greatest Conservation Need

The Central Highlands support three federal endangered and threatened, nine state endangered, 11 state threatened, and 70 special concern and regional priority wildlife species, in addition to six game species of regional priority and five nongame fish species currently without state or regional status. The Indiana bat is federal endangered and the bog turtle is federal threatened. State endangered species include the bobcat, American bittern, northern harrier, red-shouldered hawk, upland sandpiper, vesper sparrow and arogos skipper. The state threatened species include the barred owl, bobolink, Cooper's hawk, red-headed woodpecker, wood turtle, grasshopper and savannah sparrows, long-eared owl, and osprey. Special concern wildlife are cavity-nesters, colonial waterbirds, forest passerines, freshwater wetland birds, grassland birds, raptors, scrub-shrub/open field birds, reptiles, and amphibians.

Forest-interior wildlife take refuge in the Central Highland northern hardwood forest, including bobcats, cavity-nesters, forest-dwelling bats, forest passerines, raptors, eastern box turtles, northern copperheads, Fowler's toads, Jefferson salamanders, and marbled salamanders. Due to the proximity of known hibernacula, the forests of this zone likely provide summer foraging and roosting habitat for Indiana bats. Wood turtles are found in forested wetlands. Rocky outcroppings provide habitat for bobcats and northern copperheads. Wetlands in the Central Highlands provide habitat for great blue herons, freshwater wetland birds, bog turtles, spotted turtles, damselflies, and dragonflies. Tables S37 – S43 identify the species of greatest conservation need within this zone.

Figure 32. Critical landscape habitats within the Central Highlands conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Central Highlands

Table S37. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat		X		X
Reptiles				
Bog turtle		X		
Insects				
American burying beetle♦			X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table S38. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat				X
Birds				
American bittern		X		
Bald eagle		X		X
Northern harrier			X	
Red-shouldered hawk				X
Short-eared owl			X	
Upland sandpiper			X	
Vesper sparrow			X	
Mollusks				
Green floater	X**			
Insects				
Arogos skipper			X	

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S39. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Reptiles				
Wood turtle			X	X
Mollusks				
Tidewater mucket	X**			
Yellow lampmussel	X**			

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S40. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Mammals				
Eastern small-footed bat				X**
Eastern red bat				X**
Hoary bat				X**
Silver-haired bat				X**

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Mammals (continued)				
Long-tailed (Rock) shrew				X
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American golden-plover		X		
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Black-throated blue warbler				X
Blue-winged warbler				X
Broad-winged hawk				X
Brown thrasher				X
Cerulean warbler				X
Chimney swift			X	
Cliff swallow			X	
Common barn owl			X	
Common nighthawk				X
Eastern kingbird				X
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		
Hooded warbler				X
Indigo bunting			X	
Kentucky warbler				X
Least bittern		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Sharp-shinned hawk				X
Veery				X
Willow flycatcher				X
Wood thrush				X
Worm-eating warbler				X
Yellow-bellied sapsucker				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle		X	X	X
Eastern hognose snake			X	X
Eastern ribbon snake		X	X	
Northern copperhead				X
Spotted turtle		X		
Amphibians				
Carpenter frog		X		
Fowler's toad				X
Jefferson salamander				X
Marbled salamander		X		X
Northern spring salamander		X		X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forest and Forested Wetlands
Insects				
Club dragonfly	X			X
Extra-striped snaketail	X			X
New England bluet	X	X		
Pitcher plant borer moth		X		
Schweitzer's buckmoth				X
Fish				
American brook lamprey*	X			
Bridle shiner	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table S41. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock		X		X
Canada goose (Atlantic population)	X	X		
Wood duck	X	X		X
Virginia rail		X		
Fish				
Brook trout*	X			

*Species is an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table S42. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Comely shiner	X
Cutlips minnow	X
Margined madtom	X
Shield darter	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table S43. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		
Fish				
Brown trout*	X			
Rainbow trout*	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Central Highlands

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The remaining forest and grassland habitat in the Central Highlands is vulnerable to poorly planned development. Considerable habitat loss, fragmentation, and degradation already threaten forest-interior wildlife in the region. Bat hibernacula need to be identified and protected from disturbance. Wildlife in the Central Highlands are also threatened by the bioaccumulation of contaminants, human encroachment, illegal collection, ground and surface water degradation, and disease. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of critical grassland habitat (areas with >75 % herbaceous and <25% woody vegetation) as identified by the Landscape Project for upland sandpipers, vesper, grasshopper and savannah sparrows, bobolinks, special concern grassland birds and wintering raptors.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of critical forest and forested wetland habitat as identified by Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife. These include such species or suites as the bobcat, Indiana and other forest-dwelling bats, barred owl, red-shouldered hawk, interior forest passerines, cavity nesting birds, and the wood turtle. Forest patches within this zone are becoming fragmented and large contiguous parcels are somewhat rare. Protection of remaining large patches is important as well as connecting corridors.
- Identify, protect, maintain, enhance, and restore critical wetland and riparian habitats, and water quality to preserve aquatic ecosystems, as identified by the Landscape Project for freshwater wetland birds, bog turtle, wood turtle, vernal pool breeders, special concern reptiles and amphibians, rare damselflies and dragonflies, and nongame fish. .
- Inventory, determine distribution, and monitor wildlife (including nongame fish species) of greatest conservation need in the Central Highlands.
- Prevent, stabilize, and reverse declines of interior-forest species including passerines and raptors, bobcats, forest-dwelling bats, special concern reptiles and amphibians, grassland and scrub-shrub wildlife populations of birds, rare dragonflies and damselflies, butterfly and moth species of conservation concern, riparian and aquatic species such as rare freshwater mussels, and special concern fish species.
- Preserve the ecological quality and integrity of vernal pool communities.
- Protect and enhance important and unique natural communities.
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Assess large-scale habitat change (every five to 10 years).
- Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Identify and protect hibernation sites and associated staging (foraging, breeding) habitat for Indiana bat and other winter resident bat species within New Jersey.

- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Skylands Regional Landscape stakeholders during a meeting held on January 10, 2007 (see *Attachment G*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern. *(Conserve wildlife – invasives)*
2º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, re-vegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify important winter foraging sites for short-eared owls and northern harriers. Work with public and private landowners and managers to protect and maintain suitable wintering habitat through incentive programs, best management practices, and acquisition. *(Silviculture – land management; Agriculture – land management; Protect habitat – migratory birds)*
Protect critical grassland habitats identified in the Landscape Project	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for mowing, conversion to warm-season grasses) strategies to maintain and enhance large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*

Priority	Conservation Actions (continued)
1º	Consolidate adjacent grassland fields, through the elimination of hedgerows, fences, or tree lines, in areas where open land occupies a considerable amount of the surrounding landscape and grassland management can be identified as a reasonable management alternative. *(Agriculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats, assess their condition for nesting birds (golden-winged warbler and woodcock), and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create interspersed scrub-shrub habitat in a grassland matrix. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Increase the effective size and connectivity of grasslands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of grasslands and scrub-shrub habitats and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies. Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Target 2,000 hectare (7.7 sq. mi.) regions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
2º	Work with Bureau of Land Management to identify appropriate sites on public lands to maintain and enhance grasslands. Establish mowing schedules, control exotic, invasive vegetation, and establish stands of native warm season grasses on 30 - 50 acres per year within the Landscape region. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project, migratory birds)*
2º	Develop best management practices to guide public and private land managers in maintaining and enhancing grassland and other early succession habitats (scrublands and shrublands). *(Agriculture – land management; Other practices – land management)*
Protect critical forest and forested wetland habitats identified in the Landscape Project	
1º	Identify critical core forests and assess their suitability for interior forest wildlife. Incorporate the information into the Landscape Project and Biotics database. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, cerulean warblers, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create future barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older growth forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote-sensing tools, and surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*
Protect critical wetland and riparian habitats identified in the Landscape Project	
1º	Increase the effective size and connectivity of wetlands and riparian habitat on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimizing destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish, mussels)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan. *(Conserve wildlife – invasives)*
2º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/ absence surveys and monitoring to acquire data in those areas.

Priority	Conservation Actions (continued)
1º	Develop research proposal to investigate habitat requirements for woodland raptor populations. *(Conserve wildlife – rare wildlife)*
1º	Systematically survey the Central Highlands Zone for all endangered and threatened species and selected species of special concern to track population and habitat trend data. *(Monitor wildlife – long-term monitoring)*
1º	Conduct concentrated field sampling for listed or special concern fish species in areas indicated by Fish Track database queries and incorporate data into the Biotics database. *(Protect habitat – fish; Monitor wildlife – fish)*
1º	Use GIS measures, other remote-sensing tools, and surveys to determine home range and habitat use for bobcats and wood turtles. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – Landscape Project)*
1º	Identify and research water quality parameters for spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, rare mollusks, and nongame fish. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Research and evaluate effectiveness of water quality management practices on spotted turtles, Fowler's toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, rare mollusks, and nongame fish, particularly those practices associated with permitting or mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Determine population status and monitor trends of species of conservation concern in comparison to land use changes and alteration of habitat through long-term sampling and surveys. *(Monitor wildlife – long-term monitoring)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry studies during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats. *(Protect habitat – Landscape Project)*
1º	Conduct telemetry studies during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Continue to monitor reproductive success of eagles and protect nesting areas from human disturbance.
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Trap Indiana bats during spring emergence from hibernacula and apply colored, plastic bands to aid in recovery efforts during summer concentration surveys. *(Monitor wildlife – long-term monitoring)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of wildlife and rare freshwater fish species	
1º	Work with public and private landowners and managers with significant bog turtle, wood turtle, longtail salamander, cavity-nester, woodland raptor, freshwater wetland birds, grassland and scrub-shrub/open field bird populations, and special concern mollusks to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, contaminants, water quality, competition by invasive plants and animals, and hybridization. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Protect species of greatest conservation need from exotic pathogen introduction or incident through rapid response; DFW to give priority attention to these species in planning or implementing a response. *(Conserve wildlife – rare wildlife, invasives)*
1º	Research the habitat requirements for species of conservation concern (e.g., forest passerines and woodland raptors, timber rattlesnakes, northern copperheads, bobcats, and Indiana bats, where appropriate) and implement planned silviculture practices to enhance forests for these species and species suites. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife – cats, subsidized predators)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, National Park Service law enforcement, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management, and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation and controlling water levels in impoundments. *(Protect habitat – Landscape Project; Conserve Wildlife – rare wildlife; Enhance habitat – private lands)*
1º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
2º	Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g., reptiles, amphibians) and sensitive forest nesters (e.g., red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed. *(Protect habitat – recreational vehicles; Conserve wildlife - recreational vehicles)*
2º	Develop research proposal to investigate the impact of land use patterns on woodland raptors and rare reptiles and amphibians. *(Protect habitat – sprawl; Corridors - sprawl)*

Priority	Conservation Actions (continued)
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Monitor wildlife – fish)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices. *(Protect habitat – sprawl, development, Conserve wildlife – game species)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – development; Conserve wildlife – rare wildlife)*
Preserve ecological integrity of vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Work with public agencies and private landowners to maintain optimal biological buffers (beyond regulatory requirements) to preserve the integrity of vernal pools and the surrounding upland habitat for vernal pool dependent amphibians. Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – sprawl; Enhance habitat –private lands)*
Protect and enhance important and unique habitats	
1º	State agencies and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities within the Black River Wildlife Management Area (WMA). *(Protect habitat – Landscape Project)*
2º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats such as the Black River WMA and Round Valley Reservoir. *(Protect habitat – migratory birds; Corridors – migratory birds)*
2º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to continue to support the protection of the large wetland complex of the Black River WMA. *(Protect habitat – development, private lands)*

Priority	Conservation Actions (continued)
2º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to protect and enhance the high quality floodplain forest natural community and endangered plant communities at the Black River WMA through best management practices and increased law enforcement to minimize disturbance in sensitive areas. *(Protect habitat –development, sprawl; Enhance habitat – development, private lands)*
Protect and enhance bald eagle habitat	
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*

Priority	Conservation Actions (continued)
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible. *(Evaluate restoration – deer; Conserve wildlife - deer, rare wildlife)*
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and through the creation of a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer (e.g., "earn-a-buck"). *(Conserve wildlife - deer)*
2º	Work with land management agencies to survey and monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, Asian long-horned beetle, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
Identify and protect important hibernacula for wintering bats	
1º	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance. *(Monitor wildlife – long-term monitoring; Conserve wildlife - development)*
1º	Decrease or eliminate human disturbance and vandalism at hibernacula through increased patrols by the DFW, Bureau of Law Enforcement. *(Protect habitat - humans)*
2º	Assess the need for stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions. *(Protect habitat - humans)*
2º	Identify and implement appropriate protection strategies to maintain and enhance Indiana bat and other bat species' wintering habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat). *(Protect habitat - humans)*

Priority	Conservation Actions (continued)
2º	Install bat-friendly gates on important bat winter roost sites to prevent human disturbance. *(Protect habitat - humans)*
2º	Identify and protect critical staging habitat surrounding known hibernacula. *(Protect habitat – humans, development)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations. *(Protect habitat – fish)*
1º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Assess the impacts of changing water quality to native, wild, summer trout populations. *(Monitor wildlife– fish)*
Conserve and enhance native, wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Promote public education and awareness and wildlife conservation	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub/open field birds.
    - Utilize incentive programs that encourage the management of grassland and scrub-shrub communities and the conservation of bog turtles, and to protect water quality and riparian habitat in areas where rare mussels occur.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of grassland and scrub-shrub communities and bog turtles.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer and winter bat habitat.
    - Develop/maintain cooperative relationships with private landowners with bog turtles on their land.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for butterfly and moth species
    - Involve Citizen Scientists in conservation projects, such as stream bank restoration.
    - Continue volunteer-based summer bat concentration surveys.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect cavity-nester and woodland raptor nesting and foraging sites.
    - Protect and enhance riparian habitats.
    - Initiate and support eradication efforts for invasive plant species.
- Consult with conservation organizations to develop educational programs.
- Encourage the use of Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, NRCS, USFWS - NJ Field Office, and USDA, and the DCA, Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP)-Division of Fish and Wildlife (DFW) to protect cavity-nester and raptor nesting and foraging sites.
    - DFW to monitor bat hibernacula for disturbance during critical times.

- DFW to develop a plan to protect sensitive bog turtle, timber rattlesnake, and wood turtle sites from disturbance.
- DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle and wood turtle sites.
- DFW and conservation organizations to work with the DEP's Land Use Regulation Program to protect and appropriately classify wetlands for special concern reptile and amphibian populations.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, raptors, and other forest-dwelling species, and freshwater wetland birds on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
- DFW to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels and rare fish species.
- DFW to develop specific conservation plans for special concern reptiles and amphibians on state lands.
- DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
- DFW will integrate results of vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW to work with the DEP's Office of Natural Lands Management, Natural Heritage Program to develop mapping of significant vegetative communities to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
- DFW to determine groundwater recharge areas for bog turtle habitats and vernal pools with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
- DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.

  - DFW to work with USFWS and other state and federal partners to implement American Woodcock Management Plan as appropriate.
  - DFW and DEP's Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, and local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Determine distribution, occurrence, and monitor bobcats.
- Annually monitor abundance, productivity, distribution, and trends of bog turtles, wood turtles, forest-dwelling bats, cavity-nesters, colonial waterbirds, forest passerines (2-4 years), freshwater wetland birds (2-4 years), and grassland bird, raptor, and scrub-shrub/open field bird communities (2-4 years), particularly in areas beyond the reach of the Breeding Bird Survey.
- Sponsor "Hawk Watches" for raptor monitoring during the fall migration.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the vernal pool project.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

6. Urban Highlands

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

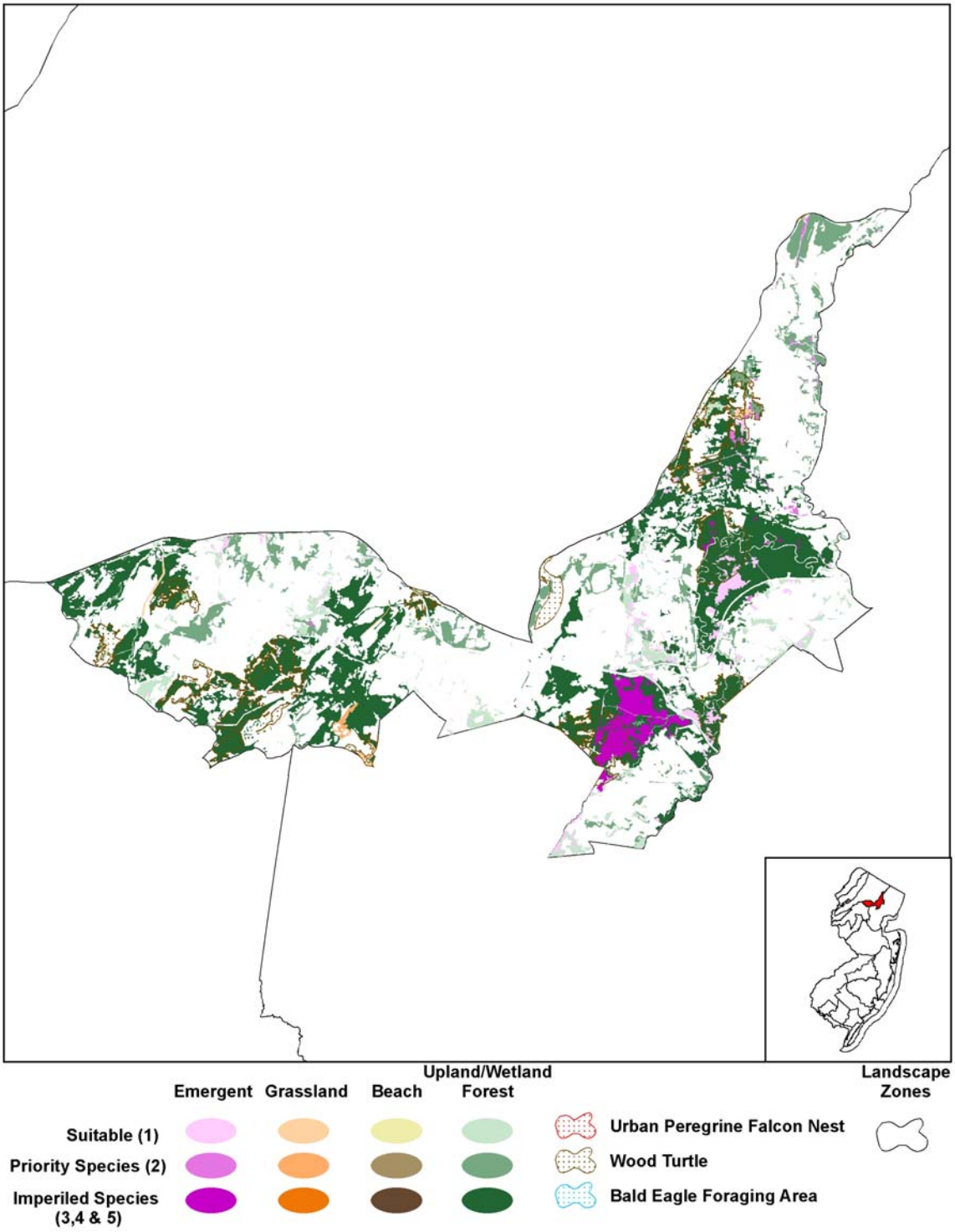
The Urban Highlands Zone is located in the central portion of Morris County and extends eastward along the Interstate 80 corridor to the county border, and then north along the Interstate 287 corridor into portions of Passaic and western Bergen counties (Figure 33). The zone is characterized by extensive development that has resulted in a highly fragmented landscape containing few areas of contiguous habitat. The remaining habitat consists primarily of floodplain forests and forested and emergent wetlands. The floodplains are prone to frequent flooding and therefore are unlikely to be developed in the future.

Publicly owned land in the Urban Highlands Zone is scarce. However, conservation areas of opportunity include Great Piece Meadows, Bog and Vly Meadows, Troy Meadows and Hatfield Swamp.

b. Wildlife of Greatest Conservation Need

The Urban Highlands support two federal endangered and threatened, nine state endangered, seven state threatened, and 51 special concern and regional priority wildlife species, in addition to six game species of regional priority and three nongame fish species currently without state or regional status. The Indiana bat is federal endangered. State endangered species include the bobcat, northern harrier, red-shouldered hawk, short-eared owl, pied-billed grebe, blue-spotted salamander, green floater, and Appalachian grizzled skipper. The state threatened species include the barred owl, Cooper's hawk, long-eared owl, red-headed woodpecker, wood turtle, tidewater mucket, and yellow lampmussel. Special concern wildlife are cavity-nesters, colonial waterbirds, forest passerines, freshwater wetland birds, grassland birds, raptors, scrub-shrub/open field birds, reptiles, and amphibians. Tables S44 – S50 identify the species of greatest conservation need within this zone.

Figure 33. Critical landscape habitats within the Urban Highlands conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Urban Highlands

Table S44. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana Bat		X		X**
Insects				
American burying beetle♦			X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table S45. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Bobcat				X
Black-crowned night-heron		X		
Northern harrier		X	X	
Pied-billed grebe		X		
Red-shouldered hawk				X
Short-eared owl		X	X	
Amphibians				
Blue-spotted salamander				X
Mollusks				
Green floater	X**			
Insects				
Appalachian grizzled skipper			X	

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S46. State Threatened Species

Common Name	Water	Emergent Wetland	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Cooper's hawk				X
Long-eared owl				X
Red-headed woodpecker				X
Reptile				
Wood turtle				X
Mollusks				
Tidewater mucket	X**			
Yellow lampmussel	X**			

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S47. Nongame Species of Conservation Concern

Common Name	Water	Emergent Wetland	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern small-footed bat				X**
Eastern red bat				X**
Hoary bat				X**
Silvered-haired b at				X**
Long-tailed (Rock) shrew				X
Southern bog lemming			X	X
Birds				
American golden-plover				
Baltimore oriole				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Emergent Wetland	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Black-and-white warbler				X
Blue-winged warbler				X
Brown thrasher				X
Chimney swift				X
Cliff swallow			X	
Common barn owl			X	
Common nighthawk				X
Eastern kingbird				X
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		
Indigo bunting			X	
Least bittern		X		
Northern flicker				X
Pine warbler				X
Prairie warbler				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Veery				X
Willow flycatcher				X
Wood thrush				X
Yellow-bellied sapsucker				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle		X	X	X
Eastern hognose snake			X	X
Eastern ribbon snake		X	X	
Northern copperhead				X
Amphibians				
Fowler's toad				X
Jefferson salamander				X
Marbled salamander				X
Insects				
Club dragonfly	X			X
Extra-striped snaketail	X			X
New England bluet	X	X		
Pitcher plant borer moth		X		
Schweitzer's buckmoth				X
Fish				
American brook lamprey*	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table S48. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock		X	X	X
Canada goose (Atlantic population)	X	X		
Virginia rail		X		
Wood duck	X	X		X
Fish				
Brook trout*	X			

*Species is an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table S49. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Cutlips minnow	X
Margined madtom	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table S50. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		
Fish				
Brown trout*	X			
Rainbow trout*	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Urban Highlands

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

The remaining forest, grassland and wetland habitat in the Urban Highlands exist primarily in areas not conducive to development due to high water tables and frequent flooding. Some large forested wetland tracts remain in the area mentioned above and provide remnant habitat for area-sensitive forest species. Much of the zone is already developed and only small, highly fragmented patches of upland habitat remain interspersed throughout. Considerable habitat loss, fragmentation, and degradation already threaten forest-interior wildlife in the region. Wildlife in the Urban Highlands is threatened by the bioaccumulation of contaminants, human

encroachment, ground and surface water degradation, and disease. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large tracts of critical forest and forested wetland habitat as identified by Landscape Project, such as Great Peace Meadows, for area-sensitive species such as the barred owl, red-shouldered hawk, forest-dwelling bats, and bobcat.
- Identify, protect, maintain, enhance, and restore critical wetland and riparian habitats, and water quality to preserve aquatic ecosystems, as identified by Landscape Project for freshwater wetland birds, wood turtle, vernal pool breeders, special concern reptiles and amphibians, rare damselflies and dragonflies, and nongame fish.
- Inventory, determine distribution, and monitor wildlife (including nongame fish species) of greatest conservation need in the Urban Highlands.
- Prevent, stabilize, and reverse declines of interior-forest species including passerines and raptors, and special concern reptiles and amphibians, and riparian and aquatic species such as rare freshwater mussels, freshwater wetland birds, and special concern fish species.
- Preserve the ecological quality and integrity of vernal pool communities.
- Protect and enhance important and unique natural communities.
- Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Promote public education and awareness, wildlife conservation, and viewing opportunities.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Skylands Regional Landscape stakeholders during a meeting held on January 10, 2007 (see *Attachment G*). However, the Division of Fish and Wildlife's Endangered and Nongame Species Program intends to hold a northern-based meeting focused on our urban stakeholders to better address conservation issues in urban areas. Therefore, the goals and actions identified within this zone are subject to revisions in the near future. Actions identified within the conservation zone, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Action
Protect wildlife habitat through implementation of Landscape Project mapping	
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*

Priority	Conservation Action (continued)
2º	Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern. *(Conserve wildlife – invasives)*
2º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, re-vegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
Protect critical forest and forested wetland habitats identified in the Landscape Project	
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical core forests (forest area >90 meters from the forest edge) and maintain species information in the Biotics database. Preserve and protect core forests through: • Regulations, land acquisition, and incentive programs for forest-dependent breeding species: forest-interior passerines and bobcats (³ 10 hectares or 24.7 acres of core forest), forest raptors (³ 100 hectares or 247 acres of contiguous forest), timber rattlesnakes (if unknown foraging habitat, a minimum of 1 ½ mile radius surrounding known den locations or 4,521 acres), and Indiana bats (³ 6.8 hectares or 17 acres of contiguous forest) per the Forest Management Guidelines for Species of Conservation Concern in New Jersey. • Preservation efforts focused on area- and disturbance-sensitive breeding species in core forests located at least 2,500 meters from major highways. • Prevention of activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). • Identification of habitats adjacent to core forests that can be preserved and/or managed to increase the total size of forest habitat. • Collaboration with land managers, forest stewards, and private landowners to develop and implement best management practices. *(Protect habitat – Landscape Project; Silviculture – land management)*

Priority	Conservation Action (continued)
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, cerulean warblers, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create future barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older growth forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*
Protect critical wetland and riparian habitats identified in the Landscape Project	
1º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*

Priority	Conservation Action (continued)
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat –private lands)*
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish, mussels)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan. *(Conserve wildlife – invasives)*
2º	Increase populations of pied-billed grebes and American bitterns through freshwater wetland management such as creating impoundments, maintaining appropriate water levels, restricting recreational activities and monitoring contaminant levels. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas.
1º	Systematically survey the Urban Highlands Zone for all endangered and threatened species and selected species of special concern to track population and habitat trend data. *(Monitor wildlife – long-term monitoring)*
1º	Determine population status and monitor trends of species of conservation concern, including forest-dwelling bats, in comparison to land use changes and alteration of habitat through long-term sampling and surveys. *(Monitor wildlife – long-term monitoring)*
1º	Use GIS measures, other remote-sensing tools, and surveys to determine home range and habitat use for wood turtles, and to identify important travel corridors. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – Landscape Project)*

Priority	Conservation Action (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to determine home range territories and habitat use for bobcats, and to identify important travel corridors. Use the new data to refine species occurrence areas and integrate into the Biotics database. *(Protect habitat – Landscape Project)*
1º	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance. *(Monitor wildlife – long-term monitoring; Conserve wildlife - development)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry studies during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats. *(Protect habitat – Landscape Project)*
1º	Conduct telemetries study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct surveys to find more information about species and management requirements for secretive marsh nesting birds. *(Conserve wildlife – rare wildlife)*
2º	Trap Indiana bats during spring emergence from hibernacula and apply colored, plastic bands to aid in recovery efforts during summer concentration surveys. *(Monitor wildlife – long-term monitoring)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Action (continued)
Prevent, stabilize, and reverse declines of wildlife and rare freshwater fish species	
1º	Develop and implement habitat conservation goals that will meet the recovery needs of endangered and threatened wildlife populations that depend on forest habitats. These include guidelines for forest silviculture on public and private lands to enhance forest maturity and canopy, and replanting to reduce fragmentation. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Silviculture – land management; Enhance habitat – private lands)*
1º	Work with private landowners with significant wood turtle, northern copperhead, cavity-nester, and woodland raptor, freshwater wetland bird, and grassland and scrub-shrub/open field bird populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, contaminants, water quality, competition by invasive plants and animals, and hybridization. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Protect species of greatest conservation need from exotic pathogen introduction or incident through rapid response; DFW to give priority attention to these species in planning or implementing a response. *(Conserve wildlife – rare wildlife, invasives)*
1º	Maintain and enhance reptile and amphibian populations, particularly those that are endangered because of illegal collection for the pet trade (wood and bog turtles) and those populations most susceptible to road mortality (known box turtle breeding locations near roads and amphibian breeding migration corridors) through increased law enforcement and public education. *(Conserve wildlife – rare wildlife; Protect habitat – roads, humans; Corridors – roads)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
1º	Research the habitat requirements for species of conservation concern (e.g., forest passerines and woodland raptors, timber rattlesnakes, northern copperheads, bobcats, and Indiana bats, where appropriate) and implement planned silviculture practices to enhance forests for these species and species suites. *(Protect habitat – Landscape Project; Silviculture – land management; Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to identify, and best management practices to maintain, enhance, and/or protect critical habitats for northern harriers, barred owls, and wood turtles, and assess their condition for maintaining populations. Develop protection strategies to maintain and enhance populations and habitat (e.g., innovative public and private partnerships, provide private landowner incentives and develop cooperative agreements to protect and manage habitat). *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management, and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation and controlling water levels in impoundments. *(Protect habitat – Landscape Project; Conserve Wildlife – rare wildlife; Enhance habitat – private lands)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife – cats, subsidized predators)*
1º	Assess the need for stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions. *(Protect habitat - humans)*
1º	Decrease or eliminate human disturbance and vandalism at hibernacula through increased patrols by the DFW, Bureau of Law Enforcement. *(Protect habitat - humans)*
1º	Identify and implement appropriate protection strategies to maintain and enhance Indiana bat and other bat species' wintering habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat). *(Protect habitat - humans)*
1º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – development; Conserve wildlife – rare wildlife)*
1º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Protect habitat – Landscape Project)*

Priority	Conservation Action (continued)
2º	Compile better life history information on urban species, such as kinds of nest predators and levels of nest depredation, breeding longevity and reproductive effort over time, characteristics of preferred nesting requirements, fidelity to breeding and wintering sites, and better assessment of migration routes and destinations.
2º	Identify groundwater recharge areas for blue-spotted salamander breeding sites and incorporate the sites into the Biotics database. *(Conserve wildlife – rare wildlife)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices. *(Protect habitat – sprawl, development, Conserve wildlife – game species)*
Preserve ecological integrity of vernal pool communities	
1º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project. *(Protect habitat – Landscape Project)*
1º	Work with public agencies and private landowners to maintain optimal biological buffers (beyond regulatory requirements) to preserve the integrity of vernal pools and the surrounding upland habitat for blue-spotted salamanders and other vernal pool species. Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat –sprawl; Enhance habitat –private lands)*
Protect and enhance important and unique habitats	
1º	State agencies and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in Great Piece Meadows, Bog & Vly Meadows, and Troy Meadows. *(Protect habitat – Landscape Project)*
2º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats such as Great Piece Meadows, Bog & Vly Meadows, Troy Meadows, and other "oases" in urban and suburban areas. *(Protect habitat – migratory birds; Corridors – migratory birds)*

Priority	Conservation Action (continued)
2º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to continue to support the protection of the large wetland complexes of the Great Piece Meadows, Bog & Vly Meadows, and Troy Meadows. *(Protect habitat – development, sprawl)*
2º	Work with local governments and NJ DEP's NHP to protect and enhance the high quality floodplain forest natural community at Great Piece Meadows, Bog & Vly Meadows, and Troy Meadows through best management practices. *(Protect habitat – development, sprawl; Enhance habitat – development, private lands)*
2º	Work with local governments and NJ DEP's NHP to protect and enhance the hardwood swamp natural community and federal threatened plant species and other rare plant communities at Great Piece Meadows, Bog & Vly Meadows, and Troy Meadows through best management practices and increased law enforcement to minimize disturbance in sensitive areas. *(Protect habitat – humans, development, sprawl; Enhance habitat – development, private lands)*
Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and through the creation of a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible. *(Evaluate restoration – deer; Conserve wildlife - deer, rare wildlife)*

Priority	Conservation Action (continued)
2º	Work with land management agencies to survey and monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, Asian long-horned beetle, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer (e.g., "earn-a-buck"). *(Conserve wildlife - deer)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations. *(Protect habitat – fish)*
1º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Assess the impacts of changing water quality to native, wild, summer trout populations. *(Monitor wildlife– fish)*
Conserve and enhance native, wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Promote public education and viewing opportunities	
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing backyard habitat management and the Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*

Priority	Conservation Action (continued)
2º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub/open field birds.
    - Utilize incentive programs that encourage the management of forest communities, and to protect water quality and riparian habitat in areas where rare mussels occur.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of forest communities. Develop/maintain cooperative relationships with private landowners with bog turtles on their land.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer and winter bat habitat.
    - Work with landowners to inventory their properties for the presence and severity of non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation

Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short- and long-term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for butterfly and moth species.
    - Involve Citizen Scientists in conservation projects, such as stream bank restoration.
    - Continue volunteer-based summer bat concentration surveys.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect cavity-nester and woodland raptor nesting and foraging sites.
    - Protect and enhance riparian habitats.
    - Initiate and support eradication efforts for invasive plant species.
- Consult with conservation organizations to develop educational programs.
- Encourage the use of Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, NRCS, USFWS - NJ Field Office, and USDA, and the DCA, Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) protect cavity-nester and raptor nesting and foraging sites.
    - DFW to develop a plan to protect sensitive bog turtle and wood turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle, timber rattlesnake, and wood turtle sites.

- DFW and conservation organizations to work with the DEP's Land Use Regulation Program (LURP) to protect and appropriately classify wetlands for blue-spotted salamanders and special concern reptile and amphibian populations.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and other forest-dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners.
- DFW to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels and rare fish species.
- DFW to develop specific conservation plans for special concern reptiles and amphibians on state lands.
- DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
- DFW will integrate results of vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW to work with the DEP's Office of Natural Lands Management, Natural Heritage Program (NHP) to develop mapping of significant vegetative communities to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
- DFW to determine groundwater recharge areas for bog turtle habitats and vernal pools with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
- DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
- DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
- DFW to work with USFWS and other state and federal partners to implement American Woodcock Management Plan as appropriate.
- DFW and DEP's Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.

  - DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to work with the State Planning Commission, the Office of Smart Growth and local governments to protect critical wildlife habitat and unique communities through the designation of Special Resource Areas within the State Development and Redevelopment Plan.
  - DFW to work with the newly created Highlands Council to implement the Landscape Project within the Highlands Region. Work with the Council to designate "no build zones" in the preservation area that are identified as critical habitat on the Landscape maps. Help to identify conservation areas in the surrounding planning area based on Landscape maps.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, and local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Annually monitor abundance, productivity, distribution, and trends of wood turtles, forest-dwelling bats, cavity-nesters, colonial waterbirds, forest passerines (2 – 4 years), freshwater wetland birds (2 – 4 years), and raptor and scrub-shrub/open field bird communities (2 – 4 years), particularly in areas beyond the reach of the Breeding Bird Survey.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the Vernal Pool Project
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

7. Southern Highlands

a. Habitats
b. Wildlife of Greatest Conservation Need
c. Threats to Wildlife and Associated Habitats
d. Conservation Goals
e. Conservation Actions
f. Potential Partnerships to Deliver Conservation
g. Monitoring Success

a. Habitats

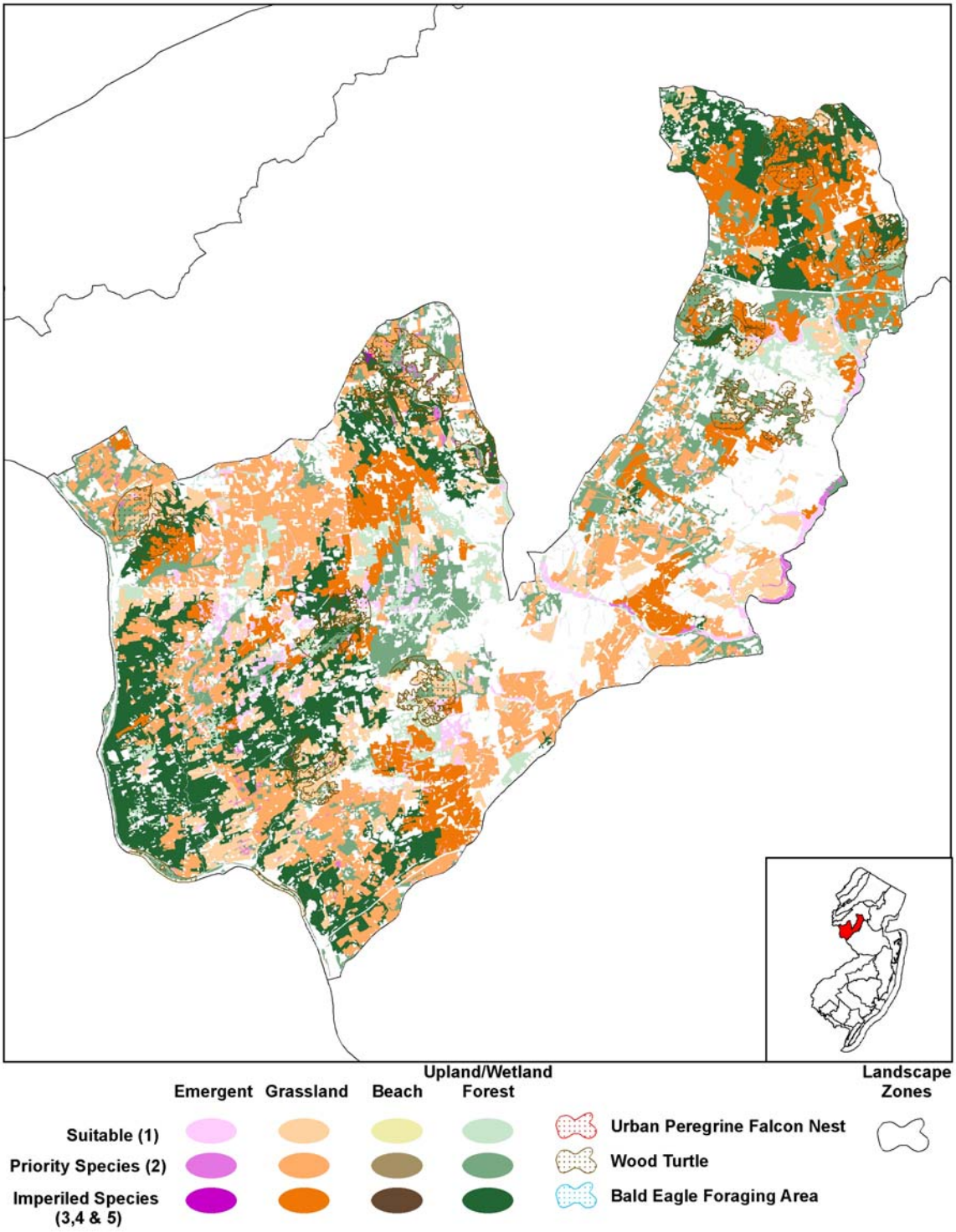
The Southern Highlands Zone is located primarily in southern Hunterdon and extreme eastern Somerset counties (Figure 34). Agricultural fields of cropland and pastures dominate the area. The remaining forest habitat is highly fragmented and exists primarily as small patches interspersed by development and agriculture. Forested ravines exist in the western portion of the zone where small tributary streams flow into the Delaware River. Floodplain forests exist along the Delaware River and provide important habitat to migrating birds. Scattered emergent wetlands occur throughout the zone but many have been impacted by human activity and development.

Very little publicly owned land exists in this zone. Conservation areas of opportunity include the D& R Canal, Bull's Island State Park and the extensive holdings of the Hunterdon County Park System.

b. Wildlife of Greatest Conservation Need

The Southern Highlands supports two federal endangered and threatened, six state endangered, 11 state threatened, and 57 special concern and regional priority wildlife species, in addition to six game species of regional priority and six nongame fish species currently without state or regional status. The Bog turtle is the federally threatened species. The red-shouldered hawk, northern harrier, short-eared owl, upland sandpiper, vesper sparrow, green floater and Appalachian grizzled skipper are state endangered species. State threatened wildlife include the barred owl, Cooper's hawk, long-eared owl, osprey, bobolink, grasshopper sparrow, savannah sparrow, wood turtle, long-tailed salamander, tidewater mucket, and yellow lampmussel. Special concern wildlife are cavity-nesters, colonial waterbirds, forest passerines, freshwater wetland birds, grassland birds, raptors, and scrub-shrub birds. Tables S51 – S57 identify the species of greatest conservation need within this zone.

Figure 34. Critical landscape habitats within the Southern Highlands conservation zone, as identified through the Landscape Map (v2).



Wildlife Species and Associated Habitats of the Southern Highlands

Table S51. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana Bat		X		X**
Reptiles				
Bog turtle		X		
Insects				
American burying beetle♦			X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table S52. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Northern harrier		X	X	
Short-eared owl			X	
Upland sandpiper			X	
Vesper sparrow			X	
Mollusks				
Green floater	X**			
Insects				
Appalachian grizzled skipper			X	

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S53. State Threatened Species

Common Name	Water	Emergent Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred owl				X
Bobolink			X	
Cooper's hawk				X
Grasshopper sparrow			X	
Long-eared owl			X	X
Osprey		X		
Savannah sparrow			X	
Reptiles				
Wood turtle				X
Amphibians				
Long-tailed salamander				X
Mollusks				
Tidewater mucket	X**			
Yellow lampmussel	X**			

**Riverine habitat, within Landscape Map, these species are identified within the "Emergent Wetlands" layer
X: Species occurs within the identified habitat.

Table S54. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern small-footed bat				X**
Eastern red bat				X**
Hoary bat				X**
Silver-haired bat				X**
Long-tailed (Rock) shrew				X
Southern bog lemming				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Acadian flycatcher				X
American golden-plover		X		
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Blue-winged warbler				X
Brown thrasher				X
Chimney swift				X
Cliff swallow			X	
Common barn owl			X	
Common nighthawk				X
Eastern kingbird				X
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee				X
Eastern wood-pewee				X
Field sparrow			X	
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Green heron		X		
Hooded warbler				X
Indigo bunting			X	
Kentucky warbler				X
Louisiana waterthrush				X
Northern flicker				X
Northern parula				X
Prairie warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Scarlet tanager				X
Sharp-shinned hawk				X
Veery				X
Willow flycatcher				X
Wood thrush				X
Worm-eating warbler				X
Yellow-bellied sapsucker				X
Yellow-throated vireo				X
Yellow-throated warbler				X
Reptiles				
Eastern box turtle				X
Eastern hognose snake			X	X
Eastern ribbon snake		X	X	
Northern copperhead				X
Spotted turtle		X		
Amphibians				
Carpenter frog		X		
Fowler's toad				X
Jefferson salamander				X
Marbled salamander		X		X
Northern spring salamander				X
Insects				
Club dragonfly	X			X
Extra-striped snaketail	X			X
New England bluet	X	X		
Pitcher plant borer moth		X		
Schweitzer's buckmoth				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Fish				
American brook lamprey*	X			
Bridle shiner	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy-NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table S55. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		
American woodcock			X	X
Canada goose (Atlantic population)	X	X		
Virginia rail		X		
Wood duck	X	X		X
Fish				
Brook trout*	X			

*Species is an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table S56. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Water
Fish	
Comely shiner	X
Cutlips minnow	X
Hickory shad	X
Margined madtom	X
Shield darter	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table S57. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
River otter	X	X		X
Birds				
Ruffed grouse				X
Sora rail		X		
Fish				
Brown trout*	X			
Rainbow trout*	X			

*Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Southern Highlands

For complete literature review on the impacts of habitat loss and fragmentation, please see New Jersey's Landscape Project Report, Attachment A or visit our website: www.njfishandwildlife.com/ensp/landscape/lp_report.pdf

Encroaching development, disturbance, habitat loss, fragmentation, and degradation threaten the wildlife of the Southern Highlands Zone. Invasive plants alter wet meadows that are bog turtle habitat. The use of pesticides, mowing, and other agricultural practices endanger grassland birds and their habitats. Illegal collection and road mortality impact bog turtles and wood turtles. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Identify, protect, enhance, and/or restore endangered, threatened, and special concern wildlife and fish populations and their habitats through full implementation of Landscape Project.
- Identify, protect, maintain, enhance, and restore large contiguous tracts of critical grassland (areas with >75 % herbaceous and <25% woody vegetation) habitat as identified by the Landscape Project for upland sandpipers, northern harriers, vesper, grasshopper and savannah sparrows, bobolinks, special concern grassland birds, wintering raptors, and special concern butterflies and moths.
- Identify, protect, enhance, and restore important riverine and riparian habitats and water quality to preserve aquatic ecosystems for green floaters and other rare mollusks, wood turtles, special concern reptiles and amphibians, nongame fishes, and rare damselflies and dragonflies.
- Identify, protect, maintain, enhance, and restore the remaining large contiguous tracts of forest and forested wetland habitat as identified by the Landscape Project for the long-term viability of forest-dwelling, area-sensitive and interior-nesting wildlife. These include such species or suites as the Cooper's hawk, red-headed woodpecker, and forest-interior species such as interior forest passerines, cavity nesting birds, and forest-dwelling bats.
- Identify, protect, maintain, enhance, and restore critical wetland habitats as identified by the Landscape Project for bog turtles, wood turtles and long-tailed salamanders, vernal pool breeders, special concern reptiles and amphibians, and rare damselflies and dragonflies.
- Inventory and monitor all endangered, threatened and special concern wildlife (including nongame fish species) in the zone.
- Prevent, stabilize, and reverse declines of grassland and scrub-shrub species (primarily) including grassland passerines and raptors, special concern dragonflies, damselflies, butterflies and moths, rare and special concern reptiles and amphibians, and wetland/ riverine species including, rare mussels, special concern fish species, and forest-interior species such as interior forest passerines, cavity nesting birds, and forest-dwelling bats.
- Assess large-scale habitat change (every five to 10 years).
- Protect and enhance important and unique natural communities.
- Maintain the ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.

- Conserve and enhance native, wild trout populations at optimal levels.
- Promote public education and awareness and wildlife conservation.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Skylands Regional Landscape stakeholders during a meeting held on January 10, 2007 (see *Attachment G*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect wildlife habitat through implementation of Landscape Project mapping	
2º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
2º	Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern. *(Conserve wildlife – invasives)*
2º	Identify, prioritize, and reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, re-vegetation with native plants or restoring habitat structure. *(Evaluate restoration – invasives)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify important winter foraging sites for short-eared owls and northern harriers. Work with public and private landowners and managers to protect and maintain suitable wintering habitat through incentive programs, best management practices, and acquisition. *(Silviculture – land management; Agriculture – land management; Protect habitat – migratory birds)*
2º	Enhance targeted habitats for cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, scrub-shrub birds, and woodland raptors through the use of best management practices. *(Agriculture – land management; Silviculture – land management; Enhance habitat – private lands; Protect habitat – rare wildlife; Other practices – land management)*

Priority	Conservation Actions (continued)
Protect critical grassland and scrub-shrub habitats identified in the Landscape Project	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for mowing, conversion to warm-season grasses) strategies to maintain and enhance large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats, assess their condition for nesting birds (golden-winged warbler and woodcock), and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create interspersed scrub-shrub habitat in a grassland matrix. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Increase the effective size and connectivity of grasslands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of grasslands and scrub-shrub habitats and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies. Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Target 2,000 hectare (7.7 sq. mi.) regions. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Consolidate adjacent grassland fields, through the elimination of hedgerows, fences, or tree lines, in areas where open land occupies a considerable amount of the surrounding landscape and grassland management can be identified as a reasonable management alternative. *(Agriculture – land management)*

Priority	Conservation Actions (continued)
2º	Research different management techniques to understand the appropriateness of prescribed burning, mowing, brush-hogging, and other methods for maintaining suitable habitat for northeastern grassland birds and grassland dependent invertebrates. *(Conserve wildlife – rare wildlife)*
2º	Work with Bureau of Land Management to identify appropriate sites on public lands to maintain and enhance grasslands. Establish mowing schedules, control exotic, invasive vegetation, and establish stands of native warm season grasses on 30 - 50 acres per year within the Landscape region. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project, migratory birds)*
2º	Develop best management practices to guide public and private land managers in maintaining and enhancing grassland and other early succession habitats (scrublands and shrublands). *(Agriculture – land management; Other practices – land management)*
2º	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
Protect critical riverine and riparian habitats	
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish, mussels)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Identify and implement actions to protect, maintain and/or restore riverine habitat (e.g., landowner incentives, acquisition, livestock fencing and no-mow riparian buffers) critical riverine habitat as appropriate. *(Agriculture – land management; Silviculture – land management; Corridors – migratory birds)*
2º	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts. *(Conserve Wildlife – contaminants, development; Protect habitat – humans, sprawl, development, mussels, fish; Restore habitat – humans; Enhance habitat – riparian species, Odonata, private lands; Agriculture – land management; Silviculture – land management)*

Priority	Conservation Actions (continued)
Protect critical forest and forested wetland habitats identified in the Landscape Project	
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, cerulean warblers, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large areas and contiguous of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create future barred owl and red-shouldered hawk habitat. • Take action to minimize loss of older growth forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*
1º	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*

Priority	Conservation Actions (continued)
Protect critical wetland habitats identified in the Landscape Project	
1º	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning. Use GIS measures, other remote sensing tools, and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimizing destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project, sprawl; Enhance habitat –private lands)*
2º	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan. *(Conserve wildlife – invasives)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas.
1º	Systematically survey the Southern Highlands Zone for all endangered and threatened species and selected species of special concern to track population and habitat trend data. *(Monitor wildlife – long-term monitoring)*
1º	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance. *(Monitor wildlife – long-term monitoring; Conserve wildlife - development)*
1º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat – Landscape Project; Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry studies during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats. *(Protect habitat – Landscape Project)*
1º	Conduct telemetry studies during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct the annual Mid-Winter Waterfowl Survey to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Conduct the Atlantic Flyway Breeding Waterfowl Survey annually to monitor population trends. *(Monitor wildlife – long-term monitoring)*
2º	Trap Indiana bats during spring emergence from hibernacula and apply colored, plastic bands to aid in recovery efforts during summer concentration surveys. *(Monitor wildlife – long-term monitoring)*
2º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
Prevent, stabilize, and reverse declines of wildlife and rare freshwater fish species	
1º	Develop and implement habitat conservation goals that will meet the recovery needs of endangered and threatened wildlife populations that depend on grassland and scrub-shrub habitats. This includes guidelines for mowing on public and private lands to enhance breeding success for grassland species. *(Conserve wildlife – rare wildlife; Protect habitat – Landscape Project; Enhance habitat – private lands)*
1º	Work with private landowners with significant grassland and scrub-shrub/open field bird populations, wood turtle, longtail salamander, cavity-nester, woodland raptor, and freshwater wetland bird populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs. *(Protect habitat – rare wildlife; Conserve wildlife – rare wildlife; Agriculture – land management; Silviculture – land management)*
1º	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, predation, disease, food availability, contaminants, water quality, competition by invasive plants and animals, and hybridization. *(Protect habitat – sprawl, recreational vehicles, humans; Conserve wildlife – contaminants, invasives, rare wildlife, subsidized predator; Evaluate restoration – roads)*
1º	Maintain and enhance reptile and amphibian populations, particularly those populations most susceptible to road mortality (known box turtle breeding locations near roads and amphibian breeding migration corridors). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*

Priority	Conservation Actions (continued)
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors - roads)*
1º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to pro*vid*e travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads; Protect habitat – roads, fish)*
1º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect habitat – fish)*
1º	Maintain and enhance reptile and amphibian populations, particularly those populations most susceptible to road mortality (known box turtle breeding locations near roads and amphibian breeding migration corridors). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*
1º	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands. *(Conserve wildlife – cats, subsidized predators)*
1º	Use GIS measures, other remote-sensing tools, and surveys to identify, and best management practices to maintain, enhance, and/or protect critical habitats for special concern mollusks, wood turtles, longtail salamanders, special concern reptiles and amphibians, nongame fishes, and special concern damselflies and dragonflies and assess their condition for maintaining populations. Work with the Bureau of Freshwater fisheries to identify critical nongame fish habitat. *(Protect habitat – fish; Conserve wildlife – rare wildlife)*
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management, and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation and controlling water levels in impoundments. *(Protect habitat – Landscape Project; Conserve Wildlife – rare wildlife; Enhance habitat – private lands)*

Priority	Conservation Actions (continued)
1º	Assess specific threats to nongame fishes, wood turtles, longtail salamanders, and other target species and take the necessary actions to restore, maintain, enhance, and protect habitat, as appropriate. Recommend Category One classification for streams supporting populations. Work with public and private landowners and managers to protect and manage riparian habitat to maintain water quality and reduce siltation. *(Conserve wildlife – rare wildlife; Protect habitat – fish, mussels)*
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles) and human disturbance (off-road vehicles). *(Protect wildlife – humans, recreational vehicles)*
1º	Decrease or eliminate human disturbance and vandalism at bat hibernacula through increased patrols by the DFW, Bureau of Law Enforcement. *(Protect habitat - humans)*
1º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Protect habitat – Landscape Project)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Monitor wildlife – fish)*
2º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices. *(Protect habitat – sprawl, development, Conserve wildlife – game species)*
2º	Assess the need for stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions. *(Protect habitat - humans)*
2º	Identify and implement appropriate protection strategies to maintain and enhance Indiana bat and other bat species' wintering habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat). *(Protect habitat - humans)*

Priority	Conservation Actions (continued)
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – development; Conserve wildlife – rare wildlife)*
Protect and enhance important and unique habitats	
2º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats such as Bull's Island State Park and the Delaware River Floodplain Forests. *(Protect habitat – migratory birds; Corridors – migratory birds)*
2º	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to protect and enhance the high quality floodplain forest natural community at the Bull's Island State Park and the Delaware River Floodplain Forests. *(Protect habitat –development, sprawl; Enhance habitat – development, sprawl)*
Maintain natural biodiversity, community integrity and structure and ecosystem function	
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible. *(Evaluate restoration – deer; Conserve wildlife - deer, rare wildlife)*
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and through the creation of a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*

Priority	Conservation Actions (continued)
2º	Work with land management agencies to survey and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, Asian long-horned beetle, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Work with the Bureau of Wildlife Management to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration. *(Conserve wildlife - deer)*
2º	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer (e.g., "earn-a-buck"). *(Conserve wildlife - deer)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations. *(Protect habitat – fish)*
1º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Assess the impacts of changing water quality to native, wild, summer trout populations. *(Monitor wildlife– fish)*
Conserve and enhance native, wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
1º	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries. *(Protect habitat – humans)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Promote public education and awareness and wildlife conservation	
1º	Develop brochures and posters about management practices for the public and for private landowners with significant bog turtle, wood turtle, cavity-nester, grassland bird, forest passerine, woodland raptor, scrub-shrub/open field bird populations. *(Education – humans)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often are a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*

Priority	Conservation Actions (continued)
1º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna. *(Education – humans)*
2º	Develop and maintain educational brochures and posters and viewing opportunities consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Protect and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, ospreys, raptors, and scrub-shrub/open field birds.
    - Utilize incentive programs that encourage the management of grassland and scrub-shrub communities and the conservation of bog turtles, and to protect water quality and riparian habitat in areas where rare mussels occur.
    - Encourage farmers to preserve farmland through conservation easements through partnerships with Green Acres, the Nature Conservancy, Land Trust, and local municipalities for the conservation of grassland and scrub-shrub communities and bog turtles.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer and winter bat habitat.

- Develop/maintain cooperative relationships with private landowners with bog turtles on their land.
- Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant invasions. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter (TNC), NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
    - Collaborate with NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for butterfly and moth species
    - Involve Citizen Scientists in conservation projects, such as stream bank restoration.
    - Continue volunteer-based summer bat concentration surveys.

Wildlife Professionals

- Collaborate with researchers in New York, Pennsylvania, and West Virginia to develop best management practices and conservation plans for scrub-shrub/open field birds.
- Collaborate with the National Native Mussel Conservation Committee and other experts to develop best management practices for areas with listed and special concern species.
- Work with American Museum of Natural History to maintain existing NY/NJ freshwater mussel web site.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Partner with NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect cavity-nester and woodland raptor nesting and foraging sites.
    - Protect and enhance riparian habitats.
    - Initiate and support eradication efforts for invasive plant species.
- Consult with conservation organizations to develop educational programs.
- Encourage the use of Landscape Project's critical habitat mapping to guide land acquisition by conservation organizations through programs such as Green Acres, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.

- Conduct habitat surveys to determine geographic distribution and severity of non-indigenous plant invasions.

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies including municipal and county planning boards, NRCS, USFWS - NJ Field Office, and USDA, and the DCA, Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to protect osprey, cavity-nester, and woodland raptor nesting and foraging sites.
    - DFW to develop a plan to protect sensitive bog turtle and wood turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle and wood turtle sites.
    - DFW and conservation organizations to work with the DEP's Land Use Regulation Program to protect and appropriately classify wetlands for special concern reptile and amphibian populations.
    - Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and other forest-dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
    - DFW to work with land managers to maintain grassland bird habitats by impeding succession with controlled burns and scheduled mowing.
    - DFW to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, freshwater mussels, and invertebrates with DEP's Division of Watershed Management and Land Use Regulation Program. Partner with them to investigate water quality and threats of contaminants/pollution and to make recommendations on stream encroachment permit issues for areas with listed mussels and rare fish species.
    - DFW to develop specific conservation plans for special concern reptiles and amphibians on state lands.
    - DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
    - DFW will integrate results of vegetative structure in response to deer densities into deer management strategies within deer management zones.
    - DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
    - DFW to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive non-indigenous plants on federal and state lands and in aquatic systems that are threatening critical wildlife habitats.
    - DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.

  - DFW to work with the DEP's Office of Natural Lands Management, Natural Heritage Program to develop mapping of significant vegetative communities to be incorporated as a layer within the Landscape Map. Sensitive information would be a separate layer for use within the NJ Department of Environmental Protection only.
  - DFW to determine groundwater recharge areas for bog turtle habitats and vernal pools with the DEP's Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality and conduct hydrological monitoring in these areas.
  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with USFWS and other state and federal partners to implement American Woodcock Management Plan as appropriate.
  - DFW and DEP's Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
  - DFW to partner with local, county, and state authorities to establish best management practices in areas where listed or special concern fish, freshwater mussels, and wildlife species occur.
  - DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to work with the State Planning Commission, the Office of Smart Growth and local governments to protect critical wildlife habitat and unique communities through the designation of Special Resource Areas within the State Development and Redevelopment Plan.
  - DFW to work with the newly created Highlands Council to implement the Landscape Project within the Highlands Region. Work with the Council to designate "no build zones" in the preservation area that are identified as critical habitat on the Landscape maps. Help to identify conservation areas in the surrounding planning area based on Landscape maps.
- DFW to lead in the development of educational materials for the public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through wildlife viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat changes over time; monitor efficacy of habitat management and restoration efforts.
- Annually monitor abundance, productivity, distribution, and trends of osprey (biannually), bog turtles, wood turtles, forest-dwelling bats, cavity-nesters, colonial waterbirds, forest

passerines (2-4 years), freshwater wetland birds (2-4 years), and grassland bird, raptor, and scrub-shrub/open field bird communities (2-4 years), particularly in areas beyond the reach of the Breeding Bird Survey.

- Sponsor "Hawk Watches" for raptor monitoring during the fall migration.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, and the Vernal Pool Project.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants.
- Continue to monitor deer densities and deer harvest data.
- Monitor populations of breeding, migratory and wintering waterfowl of conservation concern.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.

VII. Appendices

A. Appendix I: New Jersey's Most Vulnerable Wildlife

1. Definitions of Status

Table W1. Status of Wildlife in New Jersey

Endangered: A species whose prospects for survival in New Jersey are in immediate danger because of a loss or degradation of habitat, over-exploitation, predation, competition, disease, disturbance, or contamination. An endangered species requires immediate action to avoid extinction in New Jersey.
Threatened: A species that may become endangered if conditions surrounding it begin to, or continue to, deteriorate. Thus, a threatened species is one that is already vulnerable as a result of small population size, restricted range, narrow habitat affinities, or significant population decline.
Special Concern: A species that warrants special attention because continued (or further) habitat degradation or modification would result in their becoming threatened. This category also applies to species that meet these criteria and for which there is little understanding of their status in the state. The term, for the purpose of the Wildlife Action Plan, also includes species identified as regional concern in national and regional conservation plans such as Partners in Flight Bird Conservation Plans, North American Waterbird Conservation Plan (Mid-Atlantic/ New England/ Maritimes), USFWS species of conservation concern (2002), North American Waterfowl Management Plan, and the United States Shorebird Conservation Plan.
Secure/Stable: A species that appears to be secure in the state and not in danger of falling into any of the preceding three categories in the near future.
Unknown: A species for which it is impossible to assign any of the preceding statuses because enough information on which to base a judgment simply does not exist.
Extirpated: Applies to a species previously known to occur in the state for which there is substantial evidence that no extant populations currently exist.

Table W2. State and global element ranks as defined by NatureServe Conservation Status Assessment - (For more information, visit NatureServe Conservation Status Assessment web site: http://www.natureserve.org/explorer/)

S1: Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Species ranked S1 are often restricted to specialized habitats and/ or restricted to an extremely small (3%) geographical area of the state. Also included are species which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are species for which even with intensive searching, sizable additional occurrences are unlikely to be discovered.
S2: Imperiled in New Jersey because of rarity (6 to 20 occurrences or few remaining individuals or acres). Historically many of these species may have been more frequent, but now, largely through habitat destruction, are known from fewer extant occurrences. The S2 rank also includes species which occur in habitats restricted to 10 % of the total state area.

(**Appendix I continued)**

S3: Rare in state with 21-100 occurrences. Includes species which are widely distributed in the state but often occurring in small populations, and also in habitats which may be common or widespread. Species having a moderately restricted distribution (but greater than 10%) in New Jersey but are locally abundant, are also included. Species ranked S3 are not yet imperiled in state but may soon be if additional populations are destroyed.
S4: Apparently secure in state, with many occurrences.
S5: Demonstrably secure in state and essentially ineradicable under present conditions.
SA: Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.
SH: Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/ or potential habitat, no extant occurrences are known. Since not all of the historic occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.
SU: Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.
SZ: Not of practical conservation concern in New Jersey, because there are no definable occurrences although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined. Typically, the SZ rank applies to a non-breeding population (N) in the state – for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration. Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrations occur in an irregular, transitory and dispersed manner.
G1: Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2: Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3: Either very rare and local throughout its range or found locally (even abundantly at some of the locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout it's range; with the number of occurrences in the range of 21-100.
G4: Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.

(**Appendix I continued)**

G5: Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.
B: Refers to the breeding population of the element in the state.
N: Refers to the non-breeding population of the element in the state.
Q: Element containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.

(**Appendix I continued)**

2. Wildlife of Greatest Conservation Need, their Location in New Jersey, and the Management Strategy

Table W3. Federal Endangered and Threatened Species*

Common Name	Scientific Name	Federal Status & Regional Priority	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Mammals								
Blue whale	*Balaneoptera musculus*	E	SA, G3G4	I				
Fin whale	*Balaneoptera physalus*	E	SZN, G3G4	I				
Humpback whale	*Megaptera novaeangliae*	E	SZN, G3	I				
Indiana bat	*Myotis sodalis*	E	S1, G2	R	R	R	R	I
North Atlantic Right whale	*Balaena glacialis*	E	-	I				
Sei whale	*Balaneoptera borealis*	E	G3	I				
Sperm whale	*Physeter macrocephalus*	E	SA, G3G4	I				
Birds								
Piping plover	*Charadrius melodus*	T & RP	S1B, G3	I				
Roseate tern	*Sterna dougallii*	E/T & RP	SHB, G4	R				
Reptiles								
Bog turtle	*Glyptemys muhlenbergii*	T	S2, G3	R	R	I	I	I
Green sea turtle	*Chelonia mydas*	E/T	SZN, G3	I	I			
Hawksbill sea turtle	*Eretmochelys imbricata*	E	SZN, G3	I	I			
Kemp's ridley sea turtle	*Lepidochelys kempi*	E	SZN, G1	I	I			
Leatherback sea turtle	*Dermochelys coriacea*	E	SZN, G3	I	I			
Loggerhead sea turtle	*Caretta caretta*	T	SZN, G3	I	I			
Mollusks								
Dwarf wedgemussel	*Alasmidonta heterodon*	E & RP	S1, G1G2			I		I
Insects								
American burying beetle**	*Nicrophorus mericanus*	E	SH, G2G3			R		R
Mitchell's satyr**	*Neonympha m. mitchellii*	E	SH, G1G2					R
Northeastern beach tiger beetle	*Cincindela d. dorsalis*	T	S1, G4	I				
Fish								
Shortnose sturgeon	*Acipenser brevirostrum*	E & RP	S3, G3		M	R		

* All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife.
** Only historic records exist, species believed to be extirpated.
T: Federally threatened species.
E: Federally endangered species.
E/T: Federally endangered species during breeding season, federally threatened species during non-breeding season.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

(**Appendix I continued)**

Table W4. State Endangered Species

Common Name	Scientific Name	Regional Priority	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Mammals								
Allegheny woodrat	*Neotoma floridana magister*		S1, G3G4			I		R
Bobcat	*Lynx rufus*		S3, G5		R	I	R	I
Birds								
American bittern	*Botaurus lentiginosos*	RP	S2B, G4	R	R	I	I	I
Bald eagle	*Haliaeetus leucocephalus*	T	S1B, S2N, G4	I	I	I	I	I
Black skimmer	*Rynchops niger*	RP	S1B, G5	I	R	I	M	
Henslow's sparrow	*Ammodramus henslowii*	RP	S1B, G4		I			
Least tern	*Sterna antillarum*	RP	S1B, G4	I	I	I	M	
Loggerhead shrike	*Lanius ludovicianus*	RP	S1B, S1N, G5 (migrant only)		R	R		
Northern goshawk	*Accipiter gentilis*		S1B, S4N, G5					I
Northern harrier	*Circus cyaneus*		S1B, S3N, G5	I	I	I		I
Peregrine falcon	*Falco peregrinus*		S1B, G4	M	M	I		R
Pied-billed grebe	*Podilymbus podiceps*	RP	S1B, S3N, G5	I	R	I		I
Red-shouldered hawk	*Buteo lineatus*		S1B, S2N, G5		I	I	I	I
Sedge wren	*Cistothorus plantensis*	RP	S1B, G5	M	I	I		I
Short-eared owl	*Asio flammeus*	RP	SHB, S3N, G5	I	I	I		I
Upland sandpiper	*Batramia longicauda*	RP	S1B, G5			I	I	I
Vesper sparrow	*Pooecetes gramineus*		S1B, S2N, G5		I	I	I	I
Reptiles								
Corn snake	*Elaphe g. guttata*		S1, G5		I		I	
Timber rattlesnake	*Crotalus h. horridus*		S2, G4		R		I	I
Queen snake*	*Regina septemvittata*		SU, G5			R		
Amphibians								
Blue-spotted salamander	*Ambystoma laterale*		S1, G5					I
Cope's gray treefrog	*Hyla chrysocelis*		S2, G5	M	I		I	
Eastern tiger salamander	*Ambystoma tigrinum*		S2, G5		I	R		
Mollusks								
Brook floater	*Alasmidonta varicosa*	RP	S1, G3					I
Green floater	*Lasmigona subviridis*	RP	S1, G3					R
Insects								
Appalachian grizzled skipper*	*Pyrgus wyandot*		SH, G2			R		R
Arogos skipper	*Atrytone arogos arogos*		S1, G3G4				I	I
Bronze copper	*Lycaena hyllus*		S2, G5		I	I		

* Only historic records exist, species believed to be extirpated.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

(**Appendix I continued)**

Table W5. State Threatened Species

Common Name	Scientific Name	Regional Priority	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Birds								
Barred owl	*Strix varia*		S3B, G5		I	I	I	I
Black rail	*Laterallus jamaicensis*	RP	S2B, G4	I	I			
Black-crowned night-heron	*Nycticorax nycticorax*	RP	S3B, S4N, G5	I	I	I	I	I
Bobolink	*Dolichonyx oryzivorus*	RP	S2B, G5		I	I	I	I
Cooper's hawk	*Accipiter cooperii*	RP	S3B, S4N, G5		I	I	I	M
Grasshopper sparrow	*Ammodramus savannarum*	RP	S2B, G5		I	I	M	I
Long-eared owl	*Asio otus*		S2B, S2N, G5		I	I		I
Osprey	*Pandion haliaetus*		S2B, G5	M	I	I	M	I
Red knot	*Calidris canutus*	RP	S3N, G5	I	I			
Red-headed woodpecker	*Melanerpes erythrocephalus*	RP	S2B, S2N, G5		I	I	I	I
Savannah sparrow	*Passerculus sandwichensis*		S2B, S4N, G5		I	I	M	I
Yellow-crowned night-heron	*Nyctanassa violaceus*	RP	S2B, G5	I	R	I	M	
Reptiles								
Northern pine snake	*Pituophis m. melanoleucus*		S3, G4		I	I	I	
Wood turtle	*Clemmys insculpta*		S3, G4			I	I	I
Amphibians								
Eastern mud salamander	*Pseudotriton montanus*		S1, G5			R	R	
Long-tailed salamander	*Eurycea longicauda*		S2, G5			R		I
Pine Barrens treefrog	*Hyla andersonii*		S3, G4		I	I	I	
Mollusks								
Eastern lampmussel	*Lampsilis radiata*		S3, G5					I
Eastern pondmussel	*Ligumia nasuta*		S1, G4G5			I		
Tidewater mucket	*Leptodea ochracea*	RP	S1, G4			R		R
Triangle floater	*Alasmidonta undulata*		S3, G4			I		I
Yellow lampmussel	*Lampsilis cariosa*	RP	S1, G3G4			M		M
Insects								
Checkered white	*Pontia protodice*		S1, G4			I		
Frosted elfin	*Callophrys irus*		S2S3, G3		I	I	I	
Silver-bordered fritillary	*Bolaria selene myrina*		S2, G5			I	I	I

RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.

(**Appendix I continued)**

Table W6. Nongame Species of Conservation Concern
Note: Recovery goals based upon regional plans.

Common Name	Scientific Name	Conservation Status	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Mammals								
Eastern red bat	*Lasiurus borealis*	RP		R	R	R	R	R
Eastern small-footed myotis	*Myotis leibii*		S1, G3		R	R	R	R
Hoary bat	*Lasiurus cinereus*	RP		R	R	R	R	R
Long-tailed (Rock) shrew	*Sorex dispar*	RP	S1, G4					R
Marsh rice rat	*Oryzomys palustris*		S3, G5	R	R	R	R	
Silver-haired bat	*Lasionycteris noctivgans*	RP		R	R	R	R	R
Southern bog lemming	*Synaptomys cooperi*	RP	S2, G5	R	R	R	R	R
Birds								
Acadian flycatcher	*Empidonax virescens*	RP	-		M	M	M	I
American golden-plover	*Pluvialis dominica*	RP	-	M	M	M		I
American kestrel	*Falco sparverius*	SC	S3B, G5		I	I	I	I
American oystercatcher	*Haematopus palliatus*	RP	-	I	M	I		
Audubon's shearwater	*Puffinus Iherminieri*	RP	-	M				
Baltimore oriole	*Icterus galbula*	RP	-		I	I	I	I
Black tern	*Chlidonias niger*	SC/ RP	SZN, G4	M	I	I		
Black-and-white warbler	*Mniotilta varia*	RP	-		I	I	I	I
Black-billed cuckoo	*Coccyzus erythropthalmus*	RP	-		I	I	I	I
Blackburnian warbler	*Dendroica fusca*	RP	-		M	I		M
Black-throated blue warbler	*Dendroica caerulescens*	RP	G5			M		M
Black-throated green warbler	*Dendroica virens*	SC	S3B, G5		I	I	I	I
Blue-headed vireo (solitary vireo)	*Vireo solitarius*	SC	S3B, G5			I		I
Blue-winged warbler	*Vermivora pinus*	RP	-		I	I	I	M
Bridled tern	*Sterna anaethetus*	RP	-	M				
Broad-winged hawk	*Buteo platypterus*	SC/ RP	S3B, G5		M	M	M	M
Brown thrasher	*Toxostoma rufum*	RP	-		I	I	M	I
Canada warbler	*Wilsonia canadensis*	SC/ RP	S3B, G5		M	M		I
Caspian tern	*Sterna caspia*	SC	SPB, G5	M				
Cattle egret	*Bubulcus ibis*	RP	-	I	M	M	M	
Cerulean warbler	*Dendroica cerulea*	SC/ RP	S3B, G4			I	M	I
Chimney swift	*Chaetura pelagica*	RP	-	I	I	I		I
Chuck-will's-widow	*Caprimulgus carolinensis*	RP	-		I	R	I	
Cliff swallow	*Petrochelidon pyrrhonota*	SC	S2B, G5			M		M
Common barn owl	*Tyto alba*	SC	S3B, G5	M	I	I	I	M
Common nighthawk	*Chordeiles minor*	SC	S3B, G5		I	M	M	I
Common tern	*Sterna hirundo*	SC/ RP	S3B, G5	I	I	M		
Dickcissel	*Spiza americana*	RP	S1B, S4N, G5		M	M	M	

(Appendix I; Nongame Species of Conservation Concern continued)

Common Name	Scientific Name	Conservation Status	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Birds (continued)								
Eastern kingbird	*Tyrannus tyrannus*	RP	-		I	I	M	I
Eastern meadowlark	*Sturnella magna*	SC/ RP	S3B, S4N, G5		I	I	M	I
Eastern screech-owl	*Otus asio*	RP	-		M	I	M	M
Eastern towhee	*Pipilo erythroph-thalmus*	RP	-		I	I	I	I
Eastern wood-pewee	*Contopus virens*	RP	-		I	I	I	I
Field sparrow	*Spizella pusilla*	RP	-		I	I	I	I
Forster's tern	*Sterna forsteri*	RP	-	M	M	M		
Glossy ibis	*Plegadis falcinellus*	RP	S3B, S4N, G5	I	I	M		
Golden-winged warbler	*Vermivora chrysoptera*	SC/RP	S3B, G4			I		I
Gray catbird	*Dumetella carolinensis*	RP	-		M	M	M	M
Gray-cheeked thrush	*Catharus minimus*	SC	-			M		M
Great blue heron	*Ardea herodias*	SC/ RP	S2B, S4N, G5	M	M	M	M	M
Great crested flycatcher	*Myiarchus crinitus*	RP	-	I	I	I	I	M
Great egret	*Ardea alba*	RP	-	M	M	M	M	
Greater shearwater	*Puffinus gravis*	RP	-	M	M	M		
Greater yellowlegs	*Tringa melanoleuca*	RP	-	M				
Green heron	*Butorides virescens*	RP	-	M	M	I	M	M
Gull-billed tern	*Sterna nilotica*	RP	S1B, G5	M				
Hooded warbler	*Wilsonia citrina*	RP	S3B, G5		M	M	M	M
Horned grebe	*Podiceps auritus*	RP	G5	M	M	M		
Horned lark	*Eremophila alpestris*	SC	S3B, S4N, G5	M	I	M	M	M
Hudsonian godwit	*Limosa haemastica*	RP	-	M				
Indigo bunting	*Passerina cyanea*	RP	-		I	I	M	I
Kentucky warbler	*Oporornis formosus*	SC/ RP	S3B, G5		I	I	I	I
King rail	*Rallus elegans*	SC/ RP	S3B, G4G5	M	M	M	M	M
Least bittern	*Ixobrychus exilis*	SC/ RP	S3B, G5	M	M	M		M
Least flycatcher	*Empidonax minimus*	SC/ RP	S3B, G5			I	I	I
Little blue heron	*Egretta caerulea*	SC/ RP	S2B, G5	I	M	I	M	
Louisiana waterthrush	*Seiurus motacilla*	RP	-		M	M	M	I
Manx shearwater	*Puffinus puffinus*	RP	-	M				
Marbled godwit	*Limosa fedoa*	RP	-	M				
Marsh wren	*Cistothorus palustris*	RP	S4B, S4N, G5	M	M	I	M	M
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*	RP	-	M				
Northern flicker	*Colaptes auratus*	RP	-		I	I	I	I
Northern gannet	*Morus bassanus*	RP	-	M	M	M		
Northern parula	*Parula Americana*	SC	S3B, G5		M	M	M	M
Pine warbler	*Dendroica pinus*	RP	-		M	M	M	M
Prairie warbler	*Dendroica discolor*	RP	-		I	I	I	I
Prothonotary warbler	*Protonotaria citrea*	RP	-		I	I	I	
Purple finch	*Carpodacus purpureus*	RP	S3B, S4N, G5			R		I

(Appendix I; Nongame Species of Conservation Concern continued)

Common Name	Scientific Name	Conservation Status	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Birds (continued)								
Purple sandpiper	*Calidris maritima*	RP	-	M				
Razorbill	*Alca torda*		-	M	M	M		
Red-throated loon	*Gavia stellata*	RP	-	M	M	M		
Rose-breasted grosbeak	*Pheucticus ludovicianus*	RP	-		I	I	I	I
Royal tern	*Stern maxima*	RP	S1B, G5	I				
Ruddy turnstone	*Arenaria interpres*	RP	-	M	I			
Saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*	RP	-	I	I	R	M	
Sanderling	*Calidris alba*	SC/ RP	-	M	I			
Scarlet tanager	*Piranga olivacea*	RP	-		I	I	I	M
Seaside sparrow	*Ammodramus maritimus*	RP	-	M	M	R	M	
Semipalmated sandpiper	*Calidris pusilla*	RP	-	I	I			
Sharp-shinned hawk	*Accipiter striatus*	SC/ RP	S2B, S3N, G5		M	M		M
Snowy egret	*Egretta thula*	SC/ RP	S3B, S4N, G5	I	I	I	M	
Spotted sandpiper	*Actitis macularia*	SC	S3B, G5		M	M	M	M
Summer tanager	*Piranga rubra*	RP	-			M		
Swainson's warbler	*Limnothlypis swainsonii*	RP	-		M			
Tricolored heron	*Egretta tricolor*	SC/ RP	S3B, G5	I	I			
Veery	*Catharus fuscescens*	SC	S3B, G5		I	I	I	I
Whimbrel	*Numenius phaeopus*	SC/ RP	S3N, G5	M				
Whip-poor-will	*Caprimulgus vociferus*	RP	S4B, G5		I	I	I	I
Willet	*Catoptrophorus semipalmatus*	RP	-	M	M	M		
Willow flycatcher	*Empidonax traillii*	RP	-		I	I		I
Wilson's phalarope	*Phalaropus tricolor*	RP	-	M				
Winter wren	*Troglodytes troglodytes*	SC	S3B, S4N, G5			M		M
Wood thrush	*Hylocichla mustelina*	RP	-		I	I	I	I
Worm-eating warbler	*Helmitheros vermivorus*	RP	S3B, G5		M	M	M	I
Yellow-bellied sapsucker	*Sphyrapicus varius*	RP	-					M
Yellow-billed cuckoo	*Coccyzus americanus*	RP	-		I	I	I	I
Yellow-breasted chat	*Icteria virens*	SC/ RP	S3B, G5		I	I	M	I
Yellow-throated vireo	*Vireo flavifrons*	RP	-		I	I	I	M
Yellow-throated warbler	*Dendroica dominica*	RP	-		M	M	M	M
Reptiles								
Coastal plain milk snake	*Lampropeltis triangulum triangulum* x *L. t. elapsoides*	SC	-			M	M	
Eastern box turtle	*Terrapene carolina carolina*	SC	-	M	M	M	M	M
Eastern kingsnake	*Lampropeltis getula getula*	SC	S4, G5		M	M	M	

(Appendix I; Nongame Species of Conservation Concern continued)

Common Name	Scientific Name	Conservation Status	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Reptiles (continued)								
Northern copperhead	*Agkistrodon contortrix mokasen*	SC	S4, G5			M		M
Northern diamondback terrapin	*Malaclemys terrapin terrapin*	SC	SU, G4	I	I	I	M	
Spotted turtle	*Clemmys guttata*	SC	-		M	M	M	M
Amphibians								
Carpenter frog	*Rana virgatipes*	SC	-		M	M	M	M
Fowler's toad	*Bufo woodhousii fowleri*	SC	-	M	M	M	M	M
Jefferson salamander	*Ambystoma jeffersonianum*	SC	S3, G5			M		M
Marbled salamander	*Ambystoma opacum*	SC	S3, G5		M		M	M
Northern spring salamander	*Gyrinophilus porphyriticus porphyriticus*	SC	S3, G5			M		M
Mollusks								
Creeper	*Strophitus undulates*	SC	-			M		M
Insects								
	Catocala jair ssp 2		S3, G4				EX	
	Eusarca fundaria		S2S3, G4		EX			
	Lytrosis sinuosa		S3, G4		EX			
	Nemoria saturiba		S1?, G4?					
	Pero zalissaria		S2S4, G4		X			
	Richia sp 2		S1, G1Q				EX	
	Simyra sp 1		S1?, G4Q		EX			
	Zanclognatha sp 1		S3, G3G4		X		EX	
A geometrid moth	*Idaea violacearia*		S1S3, G4		X		X	
A geometrid moth	*Metarranthis lateritiaria*		S1, G2G4				X	
A geometrid moth	*Metarranthis sp 1*		S2, G3		X		X	
A noctuid moth	*Apamea inebriata*		S2S4, G4		X			
A noctuid moth	*Apamea mixta*		S2S4, G3G4					
A noctuid moth	*Apharetra dentata*		S2S3, G4				X	
A noctuid moth	*Chytonix sensilis*		S1S3, G4			X	X	
A noctuid moth	*Cucullia alfarata*		S2?, G4		EX		X	
A notodontid moth	*Heterocampa varia*		S3, G3G4			X		
A noctuid moth	*Macrochilo louisiana*		S2S3, G4			X	X	
A noctuid moth	*Macrochilo santerivalis*		S1S3, G3G4		X	X		
A noctuid moth	*Macrochilo sp 1*		S3, G3		X	X	X	
A noctuid moth	*Meropleon cosmion*		S1S2, G4		X		X	
A noctuid moth	*Meropleon titan*		S1, G2G4		X			
A slugmoth	*Monoleuca semifascia*		S2S3, G4G5			X	X	
A spanworm	*Itame sp 1*		S3, G3			X	X	

(Appendix I; Nongame Species of Conservation Concern continued)

Common Name	Scientific Name	Conservation Status	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Insects (continued)								
Buchholz's gray	*Hypomecis buchholzaria*		S3, G3G4				X	
Carter's noctuid moth	*Spartiniphaga carterae*		S2, G2G3				X	
Chain fern borer moth	*Papaipema stenocelis*		S3, G4		X		X	
Clubtail dragonfly	*Gomphus septima*		S1, G2			X		X
Daecke's pyralid moth	*Crambus daeckellus*		S1S3, G1G3				X	
Doll's merolonche	*Merolonche dolli*		S1S3, G3G4			EX	X	
Dotted skipper	*Hesperia attalus*	SC	S2S3, G3G4		M		M	
Extra-striped snaketail	*Ophiogomphus anomalus*		SH, G3					X
Granitosa fern moth	*Callopistria granitosa*		S2S3, G4G5				X	
Green-faced clubtail	*Gomphus viridifrons*		S1, G3					
Half yellow moth	*Tarachidia semiflava*		S2S4, G4		X			
Harris's checkerspot	*Chlosyne harrisii*	SC	S2S3, G4			M		M
Herodias or Gerhard's underwing	*Catocala herodias gerhardi*		S3, G3				X	
Hessel's hairstreak	*Callophrys hesseli*	SC	S3S4, G3G4		M		M	
Lemmer's pinion moth	*Lithophane lemmeri*		S2, G3G4		X	X	X	
Maritime sunflower borer	*Papaipema maritima*		S1, G3	X	X			
New England bluet	*Enallagma laterale*		S1S2, G3					X
Northern metalmark	*Calephelis borealis*	SC	S2S3, G3G4					M
Pine Barrens bluet	*Enallagma recurvatum*		S3, G3		X		X	
Pine Barrens zale	*Zale sp 1*		S3, G3Q				EX	
Pink streak	*Faronta rubripennis*		S3, G3G4		X	X	X	
Pitcher plant borer moth	*Papaipema appassionata*		S2S3, G4				X	X
Placentia tiger moth	*Grammia placentia*		S1S3, G4				X	
Precious underwing	*Catocala pretiosa pretiosa*		S2S3, G4		X		EX	
Rare skipper	*Problema bulenta*		S2, G2G3		X	X	X	
Regal moth	*Citheronia regalis*		S3, G5		X			
Ringed boghaunter	*Williamsonia lintneri*		SH, G3			X		
Rippled wave	*Idaea obfusaria*		S2S4, G4G5		X			
Scarlet bluet	*Enallagma pictum*		S3, G3		X	X	X	
Schweitzer's buckmoth	*Hemileuca sp 2*		S1, G1Q					X
Southern ptichodis	*Ptichodis bistrigata*		S1S3, G3				X	
The consort, or consors underwing	*Catocala consors sorsconi*		S1S3, G4		EX	X***	EX	
Two-spotted skipper	*Euphyes bimacula*	SC	S3, G4				M	

(Appendix I; Nongame Species of Conservation Concern continued)

Common Name	Scientific Name	Conservation Status	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Fish								
American brook lamprey*	*Lampetra appendix*	RP	S2, G4			X	X	X
Atlantic sturgeon	*Acipenser oxyrhynchus*	SC** & RP	S3, G3	X	X	X		
Banded sunfish*	*Enneacanthus obesus*	RP	-				X	
Black-banded sunfish	*Enneacanthus chatedon*	RP	-				X	
Bridle shiner	*Notropis bifrenatus*	RP	-			X		X

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy - NJ Chapter
**Federal species of special concern. Note: Atlantic sturgeon is a game species, currently with a national moratorium on any take.
*** Only historic records exist, species believed to be extirpated.
SC: NJ state species of special concern.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.
EX: Extant population. Observations are extremely rare, but populations still exist in the state.

Table W7. Game Species of Regional Priority
Note: Species identified within the table have seasonal harvests within New Jersey.

Common Name	Scientific Name	Regional Priority	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Birds								
American black duck	*Anas rubripes*	RP	-	M	M	I	I	I
American woodcock	*Scolopax minor*	RP	-		I	I	I	I
Atlantic brant	*Branta bernicla*	RP	-	M		M		
Black scoter	*Melanitta nigra*	RP	-	R	R	R		
Bufflehead	*Bucephala albeola*	RP	-	M	M	M		
Canada geese (Atlantic population, migrants)	*Branta canadensis interior*	RP	-	M	M	M	M	M
Canvasback	*Aythya valisineria*	RP	-	I	I	I		
Clapper rail	*Rallus longirostris*	RP	-	M	M	M		
Common eider*	*Somateria mollissima*	RP	-	X				
Greater scaup	*Aythya marila*	RP	-	I	I	I		
Harlequin duck*	*Histrionicus histrionicus*	-	-	X				
Lesser scaup	*Aythya affinis*	RP	-	I	I	I		
Long-tailed duck	*Clangula hyemalis*	RP	-	R	R	R		
Northern bobwhite	*Colinus virginianus*	RP	-		R	R	R	R
Northern pintail	*Anas acuta*	RP	-	I	I	I		
Surf scoter	*Melanitta perspicillata*	RP	-	R	R	R		
Virginia rail	*Rallus limicola*	RP	-	R	R	R	R	R
White-winged scoter	*Melanitta fusca*	RP	-	R	R	R		
Wood duck	*Aix sponsa*	RP	-		M	M	M	M
Fish								
Brook trout♦	*Salvelinus fontinalis*		S3, G5			X		X

*Species considered regional priority, however, NJ is south of the species' normal winter range and there is no natural habitat. A few occur along man-made rock jettys each winter, but this is insignificant to the overall population status.
♦Species is a New Jersey game species, but is also an excellent indicator of water quality.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

(**Appendix I continued)**

Table W8. Fish Species
Note: Species identified within the table are nongame species within New Jersey, currently without state or regional status.

Common Name	Scientific Name	Regional Priority*	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Fish								
Comely shiner	*Notropis amoenus*	-	-			X		X
Cutlips minnow	*Exoglossum magillingua*	-	-			X		X
Hickory shad	*Alosa mediocris*	-	S3, G5	X	X	X		X
Ironcolor shiner	*Notropis chaleybaeus*	-	S1S2, G4			X	X	X
Longnose gar	*Lepisosteus osserus*	-	-					X
Margined madtom	*Noturus insignis*	-	-		X	X	X	X
Northern hogsucker	*Hypentelium nigricans*	-	-					X
Pirate perch	*Aphroderus sayanus*	-	-				X	
Rainbow smelt	*Osmerus mordax*	-	SU, G5			X		
Shield darter	*Perca peltata*	-	-			X	X	X
Slimy sculpin**	*Cottus cognatus*	-	S3, G5			X		X

**Species has undergone Delphi review and has potential listing for state species of special concern.
X: Species present. Management strategy not yet determined.

Table W9. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by DFW to be species of concern.

Common Name	Scientific Name	Regional Priority	State & Global Rank	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Mammals								
River otter	*Lutra canadensis*	-	-	M	M	M	M	M
Birds								
Ruffed grouse	*Bonasa umbellus*	-	-		R	R	R	R
Sora rail	*Porzana carolina*	-	-	R	R	R	R	R
Fish								
Brown trout*	*Salmo trutta*	-	-			X		X
Rainbow trout*	*Oncorhynchus mykiss*	-	-			X		X

* Species are not native to New Jersey. Established breeding populations exist due to stocking for recreational use.
RP: Species of regional priority; currently mammals, reptiles, and insects are not identified due to information gaps.
M: Maintain population, species occurs within specific habitat(s) of landscape region.
I: Increase and stabilize population, species occurs within specific habitat(s) of landscape region.
R: Research and restore population, suitable habitat, species presence unknown.
X: Species present. Management strategy not yet determined.

(**Appendix I continued)**

Table W10. Suites of Wildlife Species and their Location in New Jersey

Suite	Members include but are not limited to	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Mammals						
Forest Dwelling Bats	Eastern pipistrel, Indiana bat, Northern long-eared bat, Small-footed myotis,red bat, silver-haired bat and hoary bat	X	X	X	X	X
Pinnipeds	Harbor seal	X				
Whales	Blue whale, Fin whale, Humpback whale, Right whale, Sei whale, Sperm whale	X				
Birds						
Beachnesting Birds	Black skimmer, Least tern, Piping plover, American Oystercatcher, Common Tern	X	X	X	X	
Interior Forest Cavity Nesters	Barred owl, Long eared owl, Pileated woodpecker		X	X	X	X
Savannah and Forest-edge Habitat Cavity Nesters	Red-headed woodpecker, Northern flicker, American kestrel, Great crested flycatcher, Eastern screech-owl, Prothonotary warbler		X	X	X	X
Coastal High Marsh Birds	Black rail, Henslow's sparrow, Marsh wren, Northern harrier, Saltmarsh sharp-tailed sparrow, Seaside sparrow, Sedge wren, American oystercatcher, Short-eared owl	X	X	X		
Coastal Low Marsh Birds	Saltmarsh sharp-tailed sparrow and seaside sparrow					
Colonial Waterbirds	Black-crowned night-heron, Caspian tern, Forster's tern, Glossy ibis, Great blue heron, Great egret, Little blue heron, Snowy egret, Tricolored heron, Yellow-crowned night-heron, Willet, Common tern, Green heron	X	X	X	X	X
Forest Passerines	Acadian flycatcher, Black-and-white warbler, Blackburnian warbler, Black-throated blue warbler, Black-throated green warbler, Canada warbler, Cerulean warbler, Chuck-will's-widow, Eastern wood-pewee, Hooded warbler, Kentucky warbler, Least flycatcher, Louisiana waterthrush, Northern parula, Pine warbler, Prothonotary warbler, Purple finch, Rose-breasted grosbeak, Scarlet tanager, Blue-headed vireo, Veery, Whip-poor-will, Winter wren, Wood thrush, Worm-eating warbler, Yellow-billed cuckoo, Yellow-throated warbler, Yellow-throated vireo		X	X	X	X
Freshwater Wetland Birds	American bittern, King rail, Least bittern, Pied-billed grebe, Sedge wren, Spotted sandpiper		X	X	X	X
Grassland Birds	Bobolink, Eastern kingbird, Eastern meadowlark, Field sparrow, Grasshopper sparrow, Henslow's sparrow, Northern harrier, Savannah sparrow, Upland sandpiper, Vesper sparrow, American kestrel		X	X	X	X

(Appendix I; Suites of Wildlife Species and their Location in New Jersey continued)

Suite	Members include but are not limited to	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Birds (continued)						
Grassland Birds	Bobolink, Eastern kingbird, Eastern meadowlark, Field sparrow, Grasshopper sparrow, Henslow's sparrow, Northern harrier, Savannah sparrow, Upland sandpiper, Vesper sparrow, American kestrel		X	X	X	X
Migratory Shorebirds	Red knot, Ruddy turnstone, Sanderling, Semipalmated sandpiper, Whimbrel	X	X	X		
Migratory Songbirds and Raptors		X	X	X	X	X
Pelagic and Seasonally Pelagic Birds	Audubon's Shearwater, Red-throated Loon, Horned Grebe	X	X			
Forest Raptors	Barred owl, Broad-winged hawk, Cooper's hawk, Long-eared owl, Northern goshawk, Red-shouldered hawk, Sharp-shinned hawk, Bald eagle. Long-eared owl, Red-shouldered hawk		X	X	X	X
Shrub-scrub/Open Field (3 - 7 year) Birds	Baltimore oriole, Black-billed cuckoo, Blue-winged warbler, Brown thrasher, Common nighthawk, Eastern towhee, Golden-winged warbler, Gray catbird, Horned lark, Least flycatcher, Prairie warbler, Willow flycatcher, Yellow-breasted chat, Indigo bunting, Common barn owl		X	X	X	X
Early Succession (0 -3 years) Open Field Birds	Upland sandpiper, Grasshopper sparrow, Bobolink; Henslow's sparrow, Savannah sparrow, Vesper sparrow and Eastern meadowlark are found in 2-5 yr early succession habitat					
Waterfowl	American black duck, Wood duck	X	X	X	X	X
Other	Peregrine falcon, Chimney swift, Common nighthawk, Cliff swallow	X	X	X	X	X
Reptiles						
Forest Dwelling Reptiles	*Snakes:* Corn snake, Timber rattlesnake, Northern pine snake, Northern copperhead, Eastern kingsnake, Coastal plain milk snake		X	X	X	X
Reptile Inhabitants of Wetland, Marsh and Bog	*Turtles:* Bog turtles, Eastern box turtle (???or make another category for open field type), Spotted turtle (??)		X	X	X	X
Reptiles Associated with water (lakes, ponds, streams)	*Snakes:* Queen snake *Turtles:* Wood turtles		X	X	X	X
Reptiles of Special Concern	Coastal plain milk snake, Eastern box turtle, Eastern kingsnake, Northern copperhead, Spotted turtle	X	X	X	X	X
Sea Turtles	Hawksbill turtle, Kemp's ridley sea turtle, Atlantic green sea turtle, Atlantic leatherback sea turtle, Atlantic loggerhead sea turtle	X				
Amphibians						
Amphibians of Special Concern	Carpenter frog, Fowler's toad, Jefferson salamander, marbled salamander, northern spring salamander	X	X	X	X	X

(Appendix I; Suites of Wildlife Species and their Location in New Jersey continued)

Suite	Members include but are not limited to	Atlantic Coastal Landscape	Delaware Bay Landscape	Piedmont Plains Landscape	Pinelands Landscape	Skylands Landscape
Amphibians (continued)						
Vernal Pool and Vernal Sinkhole Breeders	Obligate species: Jefferson salamander, blue-spotted salamander, spotted salamander, tiger salamander, marbled salamander, wood frogs, spadefoot toad Facultative species: Pine Barrens treefrog, spring peeper, southern or northern gray treefrog, green frog southern leopard frog, pickerel frog, cricket frog, upland or NJ chorus frog, carpenter frog, bullfrog, American toad, Fowler's toad, four-toed salamander, red-spotted newt adults, long-tailed salamander, spotted turtles, painted turtles, snapping turtles, mud turtle	X	X	X	X	X
Non-vernal Sinkhole Inhabitants	Spring peeper, southern or northern gray treefrog, green frog southern leopard frog, pickerel frog, cricket frog, upland or NJ chorus frog, carpenter frog, bullfrog, American toad, Fowler's toad, red-spotted newt adults, spotted turtles, painted turtles, snapping turtles		X		X	X
Limestone Fen Inhabitants	Bog turtle, long-tailed salamander, northern red salamander, green frog, bullfrog, spotted turtle, snapping turtle					X
Mollusks						
Mollusks of Special Concern	Creeper			X		X
Insects						
Lepidoptera of Federal or State Legal Status	Mitchell's satyr, Appalachian grizzled skipper, Bronze copper, Frosted elfin, Silver- bordered fritillary, Checkered white					
Lepidoptera of Special Concern	Dotted skipper, Harris's checkerspot, Hessel's hairstreak, northern metalmark, two-spotted skipper		X	X	X	X
Odonata Species			X	X	X	X
Fish						
Anadromous of Special Concern		X	X	X	X	X

X: Species suite occurs within identified landscape region.

B. Appendix II: Status of New Jersey's Most Vulnerable Wildlife

The Plan focuses on species recognized nationally, by the state, or regionally, as candidates at risk of population declines to unstable levels. The focus to maintain ecological integrity of natural communities and ecological biodiversity must incorporate the needs of those species at greatest risk of national, regional, or local extinction. This table identifies species that are currently identified as federal or state listed species.

Table W11. NJ's listed species and their status

Common Name	Scientific Name	Federally Endangered	Federally Threatened	State Endangered	State Threatened	State Special Concern
Mammals						
Indiana bat	*Myotis sodalis*	X		X		
Bobcat	*Lynx rufus*			X		
Black right whale	*Balaena glacialis*	X		X		
Blue whale	*Balaenoptera musculus*	X		X		
Fin whale	*Balaneoptera physalus*	X		X		
Humpback whale	*Megaptera novaeangliae*	X		X		
Sei whale	*Balaneoptera borealis*	X		X		
Sperm whale	*Physeter macrocephalus*	X		X		
Allegheny Woodrat	*Neotoma floridana magister*			X		
Birds						
American bittern	*Botaurus lentiginosos*			Breeding only		Non-breeding only
American kestrel						Breeding only
Bald eagle	*Haliaeetus leucocephalus*			X		
Barred owl	*Strix varia*				X	
Black-crowned night heron	*Nycticorax nycticorax*				Breeding only	
Black-throated green warbler	*Dendroica virens*					Breeding only
Black rail	*Laterallus jamaicensis*				X	
Black skimmer	*Tynchops niger*			Breeding only	Non-breeding only	
Black tern	*Chlidonias niger*					Non-breeding only
Bobolink	*Dolichonyx oryzivorus*				Breeding only	
Broad-winged hawk	*Buteo platypterus*					Breeding only
Canada warbler	*Wilsonia Canadensis*					Breeding only
Caspian tern	*Sterna caspia*					Breeding only
Cerulean warbler	*Dendroica cerulea*					X
Cliff swallow	*Petrochelidon pyrrhonota*					Breeding only
Common barn owl	*Tyto alba*					X
Common nighthawk	*Chordeiles minor*					Breeding only
Common tern	*Sterna hirundo*					Breeding only
Cooper's hawk	*Accipiter cooperii*				Breeding only	Non-breeding only
Eastern meadowlark	*Sturnella magna*					Breeding only
Golden-winged warbler	*Vermivora chrysoptera*					X
Grasshopper sparrow	*Ammodramus savannarum*				Breeding only	Non-breeding only
Gray-cheeked thrush	*Catharus minimus*					Non-breeding only
Great blue heron	*Ardea herodias*					Breeding only
Henslow's sparrow	*Ammodramus henslowii*			X		
Horned lark	*Eremophila minimus*					Breeding only
Kentucky warbler	*Oporornis formosus*					X

(Appendix II continued)

Common Name	Scientific Name	Federally Endangered	Federally Threatened	State Endangered	State Threatened	State Special Concern
Birds (continued)						
King rail	*Rallus elegans*					Breeding only
Least bittern	*Ixobrychus exilis*					Breeding only
Least flycatcher	*Empidonax minimus*					Breeding only
Least tern	*Sterna antillarum*			X		
Little blue heron	*Egretta caerulea*					X
Loggerhead shrike	*Lanius ludovicianus*			X		
Long-eared owl	*Asio otus*				X	
Northern goshawk	*Accipiter gentiles*			Breeding only		
Northern harrier	*Circus cyaneus*			Breeding only		Non-breeding only
Northern parula	*Parula Americana*					Breeding only
Osprey	*Pandion haliaetus*				Breeding only	
Peregrine falcon	*Falco peregrinus*			X		
Pied-billed grebe	*Podilymbus podiceps*			Breeding only		Non-breeding only
Piping plover	*Charadrius melodus*	Breeding only	Non-breeding only	X		
Red-headed woodpecker	*Melanerpes erythrocephalus*				X	
Red knot	*Calidris canutus*				Non-breeding only	
Red-shouldered hawk	*Buteo lineatus*			Breeding only	Non-breeding only	
Roseate tern	*Sterna dougallii*	Breeding only	Non-breeding only	X		
Sanderling	*Calidris alba*					Non-breeding only
Savannah sparrow	*Passerculus sandwichensis*				Breeding only	
Sedge wren	*Cistothorus platensis*			X		
Sharp-shinned hawk	*Accipiter striatus*					Breeding only
Short-eared owl	*Asio flammeus*			Breeding only		Non-breeding only
Solitary vireo	*Vireo solitarius*					Breeding only
Spotted sandpiper	*Actitis macularia*					Breeding only
Tri-colored heron	*Egretta tricolor*					Breeding only
Upland sandpiper	*Batramia longicauda*			X		
Veery	*Catharus fuscescens*					Breeding only
Vesper sparrow	*Pooecetes gramineus*			Breeding only	Non-breeding only	
Whimbrel	*Numenius phaeopus*					Non-breeding only
Winter wren	*Troglodytes troglodytes*					Breeding only
Yellow-breasted chat	*Icteria virens*					X
Yellow-crowned night heron	*Nyctanassa violaceus*				X	
Reptiles						
Atlantic green sea turtle	*Chelonia mydas*	Breeding only	Non-breeding only		X	
Atlantic leatherback sea turtle	*Dermochelys coriacea*	X		X		
Atlantic loggerhead sea turtle	*Caretta caretta*		X	X		
Bog turtle	*Glyptemys muhlenbergii*		X	X		
Coastal plains milk snake integrade	*Lampropeltris triangulum triangulum x L.t. elapsoides*					X
Corn snake	*Elaphe g. guttata*			X		
Eastern box turtle	*Terrapene c. Carolina*					X
Eastern kingsnake	*Lampropeltis g. getulus*					X
Hawksbill sea turtle	*Eretmochelys imbricata*	X		X		
Kemp's ridley sea turtle	*Lepidochelys kempi*	X		X		

(**Appendix II continued**)

Common Name	Scientific Name	Federally Endangered	Federally Threatened	State Endangered	State Threatened	State Special Concern
Reptiles (continued)						
Northern copperhead	*Agkistrodon contortrix mokasen*					X
Northern diamondback terrapin	*Malaclemys t. terrapin*					X
Northern pine snake	*Pituophis m. melanoleucus*				X	
Queen snake	*Regina septemvittata*			X		
Spotted turtle	*Clemmys guttata*					X
Timber rattlesnake	*Crotalus h. horridus*			X		
Wood turtle	*Clemmys insculpta*				X	
Amphibians						
Blue-spotted salamander	*Ambystoma laterale*			X		
Carpenter frog	*Rana virgatipes*					X
Eastern mud salamander	*Pseudotriton montanus*				X	
Eastern tiger salamander	*Ambystoma tigrinum*			X		
Fowlers toad	*Bufo woohousii fowleri*					X
Jefferson salamander	*Ambystoma jeffersonianum*					X
Long-tailed salamander	*Eurycea longicauda*				X	
Marbled salamander	*Ambystoma opacum*					X
Northern spring salamander	*Gyrinophilus p. porphyriticus*					X
Pine barrens treefrog	*Hyla andersonii*				X	
Southern gray treefrog	*Hyla chrysocelis*			X		
Mollusks						
Brook floater	*Alasmidonta varicose*			X		
Creeper	*Strophitus undulates*					X
Dwarf wedgemussel	*Alasmidonta heterodon*	X		X		
Eastern lampmussel	*Lampsilis radiata*				X	
Eastern pondmussel	*Ligumia nasuta*				X	
Green floater	*Lasmigona subviridis*			X		
Tidewater mucket	*Leptodea ochracea*				X	
Triangle floater	*Alasmidonta undulata*				X	
Yellow lampmussel	*Lampsilis cariosa*				X	
Insects						
American burying beetle	*Nicrophorus mericanus*	X		X		
Appalachian grizzled skipper	*Pyrgus wyandot*			X		
Arogos skipper	*Atrytone arogos arogos*			X		
Bronze copper	*Lycaena hyllus*			X		
Checkered white	*Pontia protodice*				X	
Dotted skipper	*Hesperia attalus slossonae*					X
Frosted elfin	*Callophrys irus*				X	
Georgia (Lakehurst) satyr	*Neonympha areolatus septentrionalis*					X
Harris checkerspot	*Chlosyne harrisii*					X
Hessel's hairstreak	*Callophrys hesseli*					X
Hoary elfin	*Callophrys polios*					X
Mitchell's satyr	*Neonympha m. mitchellii*	X		X		
Northeastern beach tiger beetle	*Cincindela d. dorsalis*		X	X		
Northern metalmark	*Calephelis borealis*					X
Silver-bordered fritillary	*Bolaria selene myrina*				X	
Two-spotted skipper	*Euphyes bimacula*					X

(Appendix II continued)

Common Name	Scientific Name	Federally Endangered	Federally Threatened	State Endangered	State Threatened	State Special Concern
Fish						
Shortnose sturgeon	*Acipenser brevirostrum*	X		X		

C. Appendix III: Geology of New Jersey

New Jersey's Geology

The foundation of the New Jersey's diverse landforms was built over the course of millions of years of expanding and receding glaciers, extending and deepening rivers, rising and falling sea levels, eroding beach sand, geologic faults, and volcanoes. Present-day New Jersey reflects geologic processes that began more than 500 million years ago, with the deposition of sand, mud, and lime sediment from Paleozoic seas and floodplains, and continues today with the erosion and movement of sand to shape and reshape the barrier islands.

The New Jersey Geological Survey divides New Jersey into four distinctive physiographic provinces: Valley and Ridge, Highlands, Piedmont, and Coastal Plain.

Valley and Ridge Province

Ancient seas and floodplains during the Cambrian to Devonian, deposited sand, mud, and lime sediment on the landform that is now northwestern New Jersey. In the 570 to 345 million years since initially deposited, sedimentary layers of sandstone, shale, and limestone formed and have compressed into folds and thrust along faults to form linear belts. These belts of erosion-resistant sandstone and easily-eroded shale and limestone underlie the long, parallel ridges and valleys of northwestern New Jersey, that include the Kittatinny Ridge, the Walpack Ridge, and Flat Brook Valley.

Highlands Province

An escarpment divides the Highlands from the Valley and Ridge Provinces from Franklin to the Delaware River, north of Phillipsburg. The Highlands have the oldest rocks in New Jersey – granite, gneiss, and marble that were formed in the Precambrian, between 1.3 billion and 750 million years ago. Granite and gneiss are resistant to erosion and have persisted while streams and rivers have created the deep, steep-sided valleys. The long, parallel ridges and valleys that extend through the Highlands include Bearfort Mountain, Long Valley, and the Musconetcong Valley.

Piedmont Province

The Piedmont is separated from the Highlands by a series of major faults, including the Ramapo Fault. A prominent escarpment on the northwest side of the faults marks the extent of the Highlands. Below the faults, sandstone, shale, conglomerate, basalt, and diabase are the foundation of the broad lowland and intermittent ridges of the Piedmont. These rocks are of the Late Triassic and Early Jurassic age, 230 to 90 million years old. The rocks reside on a crustal block that dropped during the initial stages of the opening of the Atlantic Ocean. Volcanic activity created erosion-resistant basalt and diabase substrates. Basalt and diabase underlie the Palisades, Rocky Hill, Sourland Mountain, and Cushetunk Mountain and shale and sandstone-lined valleys and lowlands between them.

(**Appendix III continued)**

Coastal Plain Province

The unconsolidated sand, silt, and clay sediments of the Coastal Plain Province coincide with the rocks of the Piedmont Plains between Carteret and Trenton. These sediments were deposited in ancient river deltas and marine conditions from Cretaceous to Miocene, 135 to 5.3 million years ago, and extend past the coastline to the edge of the Continental Shelf. Late Tertiary and Quaternary rivers deposited sand and gravel that cover much of the Coastal Plain. The New Jersey coastline is the result of a rapid post-glacial rise in sea level that slowed 6,000 years ago.

Recent Glaciations

During the past two million years there have been three glaciations. The most recent glacier, the late Wisconsinian advance, began to recede approximately 20,000 years ago from Harmony across to Morristown and to the mouth of the Raritan River. Glacial deposits cover much of the substrate north of the extent of the glacier. Till, an unsorted mixture of sand, clay and boulders, covers much of the uplands. Sand and gravel from glacial meltwater and silt and clay fill the valleys and lowlands. Patches of till from older glaciations dot the landscape beyond extent of the late Wisconsinian advance.

Geologic Activities Today

The dynamic barrier islands have been formed by erosion and deposition of beach sand by waves and currents, while rivers deposit mud and sand in the bays and estuaries, expanding New Jersey's extensive brackish wetlands.

More information about the geology of New Jersey is available from the New Jersey Geological Survey Web site:

www.state.nj.us/dep/njgs

Or by contacting:

New Jersey Geological Survey
29 Arctic Parkway
P.O. Box 427
Trenton, NJ 08625
(609) 292-1185 or (609) 633-1004 (fax)

D. Appendix IV: Definitions

1. Adaptive Management Practices: A systematic 6 – step process that was developed in the early 1970's to allow for the continuous improvement of management policies and practices through learning from the outcomes of operational programs. Successful adaptive management requires that each of the six steps be completed. These are: 1) Assessment of a problem by acknowledging that there is uncertainty about what policy or practice is best for a particular issue. 2) Design a strategy through the careful selection of a policy or management practice to be employed. 3) Implementation of a policy or practice that is likely to identify knowledge that is lacking. 4) Monitor key response indicators. 5) Analyze the outcomes in relation to the original objectives to determine the effectiveness of the applied policy or practice. 6) Adjust the policy or practice based on an analysis of the results and incorporates into future decisions.
2. Atlantic population (with reference to Canada geese): Atlantic population of Canada Geese refers to the population of Canada geese that breeds in the arctic or sub arctic and migrate through or winter in New Jersey and are distinct from the resident population of Canada Geese that resides year-round in New Jersey and breeds in New Jersey parks and grasslands.
3. Biodiversity: Biological diversity (biodiversity) is the variety of life on Earth and the interactions, cycles, and processes of nature that link it all together. In its broadest definition, biodiversity includes individual species, genetic diversity within species, natural communities in which these species interact, and the ecosystems and landscapes in which species evolve and coexist.
4. Best Management Practices, or BMPs: A collection of management approaches implemented in the course of land management that minimize injury to rare wildlife, and maintain or enhance the value of habitat, for rare wildlife populations.
5. Cluster development: Residential community where homes are built in high density within a restricted portion of the development while leaving a large portion of the land in its natural state.
6. Critical areas: Area ranked as "1" through "5" in the Landscape Project. See the following sections in Appendix IIIE for further information: "General Methodology for Delineating Critical Areas," "Detailed Methodology for Delineating Critical Areas by Habitat Type," and "Detailed Methodology for Delineating Critical Areas by Special Habitat Requirements."
7. Critical habitat: Habitat that is essential to the persistence and recovery of rare species populations.
8. Habitat Conservation Plan: A method of mitigating loss of wildlife (and particularly, endangered species) habitat, which usually includes significantly improving habitat to compensate for the value of habitat lost.
9. Large Acre Lot Zoning: A change in the zoning of residential building requirements by municipalities or townships from small lots, generally ¼ to ½ acre, to large lots, generally 5 to 10 acres to restrict development and population growth within that locality.

(**Appendix IV continued)**

10. Macrosite: A large area, generally hundreds to thousands of acres, containing two or more sites that have some geographical and ecological connection relevant to conservation planning for a rare species. Rare species populations within a macrosite are generally close to one another but are not necessarily contiguous.
11. Priority species: Nongame species considered by the DEP to be species of special concern as determined by a panel of experts. The term also includes species of regional concern within regional conservation plans such as Partners in Flight Bird Conservation Plans, North American Waterbird Conservation Plan, United States Shorebird Conservation Plan, etc.
12. Restoration: the process of re-establishing the functional aspects of a given ecosystem to a semblance of its pre-disturbed state.
13. Significant habitat: Areas of land and water habitat that support unique assemblages or concentrations of wildlife of conservation concern. Many of these habitats are necessary to sustain state and regional populations.
14. Species occurrence area: A species-specific polygon that is applied to all occurrences in the Biotics database that are used to value habitat in the Landscape Project. The area of the polygon is generally based on the average home range/territory size, or other appropriate lifehistory parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25m radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat. In Version 2.0 of the Landscape Project, a species occurrence area was referred to as a “species model”.
15. Subsidized predators: Native species whose populations in some parts of their range are able to survive and, in some cases, expand, due in part to resources provided by humans.

E. Appendix V: Participants in the Development of the WAP

The development of the NJ WAP began with four existing strengths of the NJ Division of Fish and Wildlife's Endangered Species Program (ENSP) (see Overview, page 3 - 4), and then continued through the enlistment and participation of organizations, workgroups, and stakeholders (Table 1 below). The ENSP coordinated the meetings, enlisted comments and review from numerous participants, and revised the WAP as comments were received and accepted.

Specific tasks of the ENSP include:

- Provide guidance to reviewers and help to maintain the focus on the purpose of the WAP while encouraging comments and recommendations;
- Identifying potential partners and interested parties to accomplish the goals and actions set forth within the WAP;
- Facilitate discussions with and input from agency wildlife staff both within (e.g., Bureau of Wildlife Management, Bureau of Freshwater Fisheries, and outside (e.g., U.S.F.W.S. Ecological Services and Refuges staff) regarding the development of the WAP;
- Initiate and define the format and intent of the Wildlife Summit;
- Provide guidance in structuring the criteria for species of conservation priority, the plan revision process, and review of written drafts.

The Division of Fish and Wildlife (DFW) will conduct a detailed evaluation of the WAP progress concerning species status, on-going threats, and partnership successes every five years. A Wildlife Summit will be held whereby partners and key stakeholders will be asked to participate in the reviews. Public input will be solicited using online surveys and/or open forum meetings.

(**Appendix V continued)**

Table 1: Summary of WAP development

Date	Activity
Spring – Summer 2004	ENSP worked with consultant, Gideon Lachman, formerly a member of the International Association of Fish and Wildlife Agencies, to develop the first "outline draft" and general protocol for the WAP, to develop the basis of NJ's WAP.
September 9, 2004	WAP DRAFT
September 2004	ENSP solicited review and recommendations from each of the Bureaus within the NJ Division of Fish and Wildlife
November 15, 2004	WAP REVISED DRAFT
November 2004	ENSP solicited review and recommendations from: 1) Endangered and Nongame Species Program Advisory Committee (ENSAC) (see Overview, page 4), including NJ Audubon Society and the Nature Conservancy-NJ Chapter representing their constituencies, the NJ Conservation Foundation, academia, and public representatives 2) NJ Department of Environmental Protection (NJ DEP), Land Use Regulation Program, Office of Natural Lands Management, Natural Heritage Program, Division of Forestry, Division of Parks and Forestry, Division of Watershed Management 3) US Fish and Wildlife Service (New Jersey Field Office), 4) National Park Service (Gateway National Recreation Area – Sandy Hook Unit, Delaware Water Gap National Recreation Area - Millbrook) 5) US Department of Agriculture, Animal and Plant Health Inspection Service (APHIS) and Natural Resources Conservation Service (NRCS) 6) Pinelands Commission 7) National Wildlife Refuges (NWR) (Edwin B. Forsythe NWR, Cape May NWR, Supawna Meadows NWR, Great Swamp NWR, Walkill NWR) 8) Military bases or US Coast Guard natural resource managers (U.S. Coast Guard Training Center, Cape May, New Jersey and Picatinny Arsenal)
December 6, 2004	ENSP met with NJ Audubon Society, the Nature Conservancy-NJ Chapter, and the NJ Conservation Foundation to discuss comments and recommendations.
December 14, 2004	ENSP met with ENSAC to discuss comments and recommendations.
December 2004 – January 2005	ENSP solicited review by NJ Future
February – March 2005	Reviewed by Martin McHugh, Director of Fish and Wildlife and the NJ DEP Commissioner's office
March 8, 2005	WAP REVISED DRAFT

(**Appendix V continued)**

Date	Activity
April 2005	Wildlife Summit held to assemble a broad range of government and citizen organizations to foster discussion and provide recommendations regarding New Jersey wildlife conservation issues. A. Private environmental, planning wildlife groups: 1. NJ Audubon Society 2. The Nature Conservancy-NJ Chapter 3. The NJ Conservation Foundation 4. New Jersey Council of Watershed Associations a. Stonybrook Millstone Watershed Association b. South Branch Watershed Association 5. Pinelands Preservation Alliance 6. Highlands Coalition – NJ Chapter 7. Association of NJ Environmental Commissions 8. American Littoral Society 9. American Museum of Natural History 10. NJ Farm Bureau 11. Wildlife Conservation Society 12. Passaic River Coalition 13. NJ Forestry Association 14. NJ State Federation of Sportsmen's Clubs 15. Ducks Unlimited 16. Wildlife Trust 17. NJ State Council of Trout Unlimited 18. Ruffed Grouse Society 19. Conserve Wildlife Foundation of New Jersey 20. Citizens United to Protect the Maurice River and its Tributaries, Inc. B. Land Conservancies 1. Trust for Public Lands 2. Delaware and Raritan Greenway 3. Conservation Resources, Inc. 4. Natural Lands Trust, Phila. Conservationists, Inc. C. Regional Organizations 1. Sourland Planning Council 2. Delaware Valley Regional Planning Commission D. State Agencies 1. Office of Smart Growth 2. Department of Transportation, Division of Project Planning and Development 3. Office of the Governor, Ben Brickner 4. Office of U.S. Senator Frank Lautenburg, Lisa Plevin

(**Appendix V continued)**

Date	Activity
April 2005 (continued)	E. Other NJ DEP staff 1. Green Acres 2. Land Use Regulation Program 5. Office of Natural Lands Management, Natural Heritage Program 6. NJ State Forest Service 7. Division of Parks and Forestry 8. Division of Watershed Management, 9. Division of Water Quality, Municipal Finance, and Construction Element 10. Division of Water Quality, Municipal Finance/ Land Acquisition 11. NJ Natural Lands Trust 12. Office of Science and Research 13. Invasive Species Task Force F. Local officials, through: 1. County Planning Offices a. Passaic County G. Park Commissions/ Systems (Natural Resource managers) 1. Morris County Park Commission 2. Ocean County Department of Parks and Recreation 3. Somerset County Park Commission 4. Hunterdon County Park System 5. Cattus Island Ocean County Park H. Planning and engineering consultants and land use attorneys – 1. Amy S. Greene Environmental Consultants, Inc. 2. Banisch Associates 3. JM Huber Corporation 4. Maser Consulting PA I. Private foundations 1. Doris Duke Charitable Foundation 2. Geraldine R. Dodge Foundation 3. FM Kirby Foundation J. Academia 1. Academics from Rutgers University, Cook College: a. Ted Stiles, Ph.D., Professor of Ecology, Evolution and Natural Resources b. Julie Lockwood, Ph.D., Professor of Ecology, Evolution and Natural Resources c. Rick Lathrop, Ph.D., Center for Remote Sensing and Spatial Analysis K. International Association of Fish and Wildlife Agencies, David Chadwick

(**Appendix V continued)**

Date	Activity
April 2005 (continued)	L. Federal Organizations 1. US Fish and Wildlife (NJ Field Office) 2. National Park Service a. Gateway National Recreation Area – Sandy Hook Unit b. Delaware Water Gap National Recreation Area - Millbrook 3. US Department of Agriculture a. Animal and Plant Health Inspection Service (APHIS) b. Natural Resources Conservation Service (NRCS) 4. National Wildlife Refuges (NWR) a. Edwin B. Forsythe NWR b. Cape May NWR c. Great Swamp NWR d. Walkill NWR **Organizations invited, but unable to attend the Summit include:** A. Private environmental, planning wildlife groups: 1. New Jersey Council of Watershed Associations a. Upper Delaware River Watershed Assoc. b. Great Swamp Watershed Association c. Passaic River Coalition, Ella Fillipone d. Environmental Defense 2. Sierra Club 3. Regional Plan Association 4. Regional Planning Partnership 5. RiverKeepers: a. Delaware b. Hudson Riverkeepers 6. Hackensack Baykeeper 7. The Watershed Institute 8. Clean Ocean Action 9. Alliance for a Living Ocean 10. Barnegat Bay Estuary Program 11. The Jacques Cousteau National Estuarine Reserve 12. NJ Environmental Lobby 13. Wetlands Institute 14. Delaware River Basin Commission (DRBC) 15. NJ Soil Conservation Service 16. Council on Affordable Housing and the Environment 17. Quail Unlimited 18. National Wild Turkey Federation 19. Pheasants Forever 20. Knee Deep Club

(Appendix V continued)

Date	Activity
April 2005 (continued)	B. Land Conservancies 1. Morris Land Conservancy C. Regional Organizations 1. Highlands Council 2. Meadowlands Commission 3. Raritan Highlands Compact 4. Great Swamp Watershed Organization D. State Agencies 1. Board of Public Utilities 2. Palisades Interstate Park Commission-NJ 3. Pinelands Commission E. Other NJ DEP staff 1. Office of Policy and Planning 2. Invasive Species Task Force 3. Wetlands Program 4. Office of (Coastal) Engineering and Construction 5. CAFRA 6. Bureau of Water Monitoring and Standards F. Representatives from federal agencies 1. U.S. Army Corps of Engineers (both NY and Philadelphia districts) 2. National and Oceanic Atmospheric Administration (NOAA) Fisheries G. Local officials, through: 1. League of Municipalities, 2. New Jersey Conference of Mayors 3. County Planning Offices a. Hunterdon b. Burlington H. Park Commissions (Natural Resource managers) 1. Monmouth County Park Commission 2. Atlantic County Park Commission 3. Union County Park Commission I. Planning and engineering consultants and land use attorneys – 1. Howard Cohen , Esq. 2. Rutgers Environmental Law Clinic J. GIS groups 1. The New Jersey Office of Information Technology, Initiative for Community Access to Technology (ICAT) K. Private foundations 1. Surdna 2. William Penn 3. Fund for NJ 4. Victoria Foundation

(Appendix V continued)

Date	Activity
April 2005	L. Academia 1. Academics from Rutgers University, Cook College a. David Drake and Joe Paulin (Rutgers Cooperative Extension) b. Colleen Hatfield, Ph.D., Ecology, Evolution and Natural Resources c. Joan Ehrenfeld, Ph.D., Ecology, Evolution and Natural Resources 2. Princeton University a. Tony Shorris, Director, Policy Research Institute for the Region b. David Wilcove, Professor of Public Affairs and Ecology and Evolutionary Biology 3. Rutgers Cooperative Extension Service – NJ Sea Grant 4. Richard Stockton College/Center for Coastal and Environmental Studies 5. Monmouth University, Paul Gaffney, President w 6. Ramapo State College 7. Municipal Land Use Center, The College of New Jersey, Marty Bierbaum, Executive Director 8. NJ School of Conservation and the NJ School of Conservation Research Organization – Academy of Natural Sciences M. Utilities 1. NJ Utilities Association N. Federal Organizations 1. National Wildlife Refuges (NWR) a. Supawna Meadows NWR 2. Military bases or US Coast Guard natural resource managers a. U.S. Coast Guard Training Center, Cape May, New Jersey b. US Army Armament Research Development and Engineering Center (Picatinny Arsenal)
May 5, 2005	WAP REVISED DRAFT
May 2005	Review by Martin McHugh, Director of Fish and Wildlife and the office of the NJ DEP Commissioner
July 1, 2005	WAP REVISED DRAFT
July 2005	Review by ENSP staff, receipt of additional comments and recommendations from external sources
August 3, 2005	WAP REVISED DRAFT
August 2005	Review by Martin McHugh, Director of Fish and Wildlife and Commissioner Bradley Campbell, NJ DEP

(**Appendix V continued)**

Table 2: Schedule of WAP reviews and revisions

FY05	**FY06**	**FY07**	**FY08**	**FY09**	**FY10**
July 1, 2004-June 30, 2005	July 1, 2005-June 30, 2006	July 1, 2006-June 30, 2007	July 1, 2007-June 30, 2008	July 1, 2008-June 30, 2009	July 1, 2009-June 30, 2010
Develop WAP	Submit WAP for approval September 2005	Submit WAP for final approval July 2006			
FY11	**FY12**	**FY13**	**FY14**	**FY15**	**FY16**
July 1, 2010-June 30, 2011	July 1, 2011-June 30, 2012	July 1, 2012-June 30, 2013	July 1, 2014-June 30, 2015	July 1, 2015-June 30, 2016	July 1, 2016-June 30, 2017
Review WAP with partners and public in winter 2011; Revise WAP by June 30, 2011					Review WAP with partners and public in winter 2017; Revise WAP by June 30, 2017
The NJ Division of Fish and Wildlife (DFW) intends the WAP to be a dynamic document under on-going review both internally and by New Jersey's conservation community, and citizenry. Periodic amendments will be made to adapt and respond to unforeseen conservation threats and to assure that continued progress to achieving the set forth within this document.					

F. Appendix VI: Public Comments

Below is a summary of the public comments received during and shortly after the public review period from September 21, 2005 through January 15, 2006. **The comments refer to the NJ Wildlife Action Plan draft that was posted online September 21, 2005.** Comments were reviewed and where appropriate, were incorporated into the NJ Wildlife Action Plan (dated July 26, 2006). The comments have been organized by topic.

A. Trap, Neuter, Release Program & Feral Cats

No.	Comment
1	Department of Health and Senior Services (DHSS), Office of Animal Welfare has jurisdiction over feral cats…not Department of Environmental Protection (DEP) (Statute: NJSA 8:23A-1.10).
2	Statute (NJSA 8:23A-1.10) also requires trap and containment for seven days in a shelter…if the NJ Division of Fish and Wildlife (DFW) approves "trap & kill" method, DFW will incur a great cost as they will have to abide by this statute.
3	DHSS should be included as partners in Trap, Neuter, Release Program (TNR) and feral cat issues including public outreach.
4	DEP supports TNR.
5	Opposes NJ Wildlife Action Plan (Plan) on issues of being anti-TNR…wants all references to such removed from the Plan.
6	Opposes Plan on issue of banning the feeding of feral cat colonies.
7	Opposes Plan on issue of banning the TNR programs.
8	Opposes Plan on issue of supporting trap and kill programs.
9	Opposes any anti-feral cat colony statements, goals, and actions.
10	TNR works if developed properly & includes sterilization of feral cat colonies.
11	The DFW should assist TNR managers.
12	The state should create mandatory spay/neuter programs.
13	State needs improved enforcement of current abandonment laws.
14	Target TNR in urban areas or less "wildlife sensitive" areas.
15	The Plan and DFW should advocate private and non-profit financial support for TNR programs.
16	State needs to improve funds for spay/ neuter assistance program.
17	Improve the "low cost" spay-neuter assistance program to focus the limited funds on NJ residence receiving public assistance (food stamps, Medicaid, rental assistance, etc.) and/or to feral cat colony managers & caretakers.
18	Change the potential partners in the Plan to include DHSS, Animal Protection Institute, Stray Catz, Inc., and shelters.

(Appendix VI continued)

Trap, Neuter, Release Program & Feral Cats (cont'd)

No.	Comment
19	Plan identifies American Bird Conservancy, Cat Indoors, and NJ Audubon Society as partners regarding feral cat issues & outreach, but none of these are considered experts in the field re: feral cats and this presents a skewed view of the feral cat issue. [We] recommend partnership with DHSS' Office of Animal Welfare (OAW) and believe this would be the most effective partnership as OAW meets w/ organizations on "both sides" of the issue.
20	Recruit volunteers to assist in managing feral cat colonies.
21	"Cat sanctuaries" are not plausible and are deemed inhumane.
22	Public outreach must be a collaborative partnership & effort between DFW, shelters, rescue centers, & other feline-related organizations.
23	Feral cats vs. free-roaming pet cats cannot be distinguished…pets will be killed.
24	Tax credits should be given to cat sanctuaries & barn cat owners who spay/ neuter & care for their cats.
25	Encourage the adoption of feral cats when they can be domesticated.
26	In extreme cases, encourage & provide infrastructure to transport feral cats to a sanctuary or barn.
27	Page 16 of the Plan, the statement "Free-roaming house cats kill millions…" is about the nation…the Plan should identify a figure that refers to NJ only and specifically with regards to the number of species of conservation concern that are killed. Please revise as such.
28	The Plan does not provide any literature citations that support the argument that free-roaming cats kill "millions of birds, small mammals and reptiles each year in the United States" as stated in the Plan. Studies that have been conducted used small study sets in isolated areas and then applied the results across the town, state, country, etc.
29	There is a partnership between the NJ Audubon Society (NJAS) and Burlington County Feral Cats Initiative to develop a model within the county for the successes of the TNR program and feral cat colony management. Why can't this be done throughout the state or at least allow counties/ municipalities to make decisions?
30	Traps used today (leg holds, conibears, and snares) are inhumane and kill non-target (including endangered and threatened) species.
31	Hunting of feral cats is cruel and an ineffective means of controlling their populations.

B. Hunting

No.	Comment
1	Pro-immunocontraception; should include on-going research and evaluation of immuno-contraceptive drugs for deer and bears.
2	Deer are not to blame for forest understory growth & destruction, exotic Plants are the problem and deer can help reduce their presence.
3	Hunting disturbs the natural balance of the deer herd, the stability by not permitting natural selection to function appropriately.
4	"…no reason for [hunting] other than beastiality."
5	Deer are not overabundant especially in view of bobcat and coyote presence…along with reputed mountain lions. If we stop killing the predators (coyotes and bobcats), they'll help control the deer population.

(Appendix VI continued)

Hunting (cont'd)

No.	Comment
6	Public education promoting hunting "for the better" of our wildlife and natural communities is unethical. Hunting is a personal choice and should not be "pushed" onto NJ citizens.
7	General opposition to any increased hunting opportunities.
8	"Serious consideration should be given to Sunday hunting (like in NY)."

C. Legal Off-road Vehicle (ORV) riding areas

No.	Comment
1	There is no proof that the establishment of "legal riding areas" will reduce illegal off-road use. Emile DeVito (NJ Conservation Foundation) once stated that the legal ORV riders are not the same people as the illegal set of riders and that without a mandatory creation of "point of sale registration and license plates for all ORV's, money for law enforcement, and new rules…[legal riding areas] will have little or no effect on alleviating environmental damage from ORV use on conservation lands."
2	Page 27 of the Plan: line 5, "Provide areas where off-road vehicle recreation is permitted…" and line 31, "Conduct surveys of ORV users…to determine their level of satisfaction…" are activities that should be conducted by the private industry and not by those focusing on habitat and wildlife conservation.
3	Page 27 of the Plan: line 37, "…Scenarios for siting ORV parks must be investigated to develop the least disruptive and destructive areas for residents…" will do little to accomplish the primary mission of wildlife protection.

D. Goals and Implementation

No.	Comment
1	Love the Plan…wants the DEP and DFW to "take it to the next level" by setting wildlife population goals and habitat acreage goals per region. For example, in the Skylands, 1) create 5000 acres of managed grassland, 2) support nesting population of 200 pairs of kestrels, 3) support a nesting population of 1,000 grasshopper sparrows, 4) maintain 3,000 acres of scrub-shrub habitat, 5) maintain 10,000 acres of early successional forest, 6) support 500 nesting pair of golden-winged warblers, and 7) support 1,000 pairs of ruffed grouse.

E. Forestry

No.	Comment
1	Please add foresters to the list of potential partners to deliver conservation.
2	Silviculture does not contribute to forest fragmentation.
3	Forest service and NJ Foresters Association should participate and the Plan should include active woodland harvest. The Plan ignores ongoing tree farming and forestry practices of the region.
4	The Plan is "full of potential restrictions to landowners, but is bereft of specific compensation recommendations. [The Plan] should require direct (personal) notification of individual landowners directly impacted."

(Appendix VI continued)

F. Miscellaneous

No.	Comment
1	The Plan should include the evaluation of the impacts of communication towers & buildings with artificial lighting as potential problems for migrating birds (and/or bats) through increasing collisions and confusion.
2	The Plan should identify poisons/ chemicals that negatively affect wildlife and deter usage of these chemicals (i.e. anticoagulant rodenticides).
3	The extended public comment period of Dec. 31, 2005, was not enough time to review the Plan and as such the NJ Animal Rights Alliance (NJARA) "reserves the right to challenge the actions of the DEP in connection with the preparation, publication, and adoption of the" Plan.
4	Page 19 of the Plan: lines 27-29 & 32-34, states that the clearing of upland vegetation around wetlands is a threat due to increased runoff, higher temperatures, etc. [We] feel that this activity is more directly related to the threat on the wildlife inhabiting this area. NJ needs stronger regulations protecting the vegetative buffer around wetlands to protect waterways and wetlands and for upland habitats.
5	DEP should dedicate staff and funds to urban/ suburban comprehensive surveys to fill in data gaps. These gaps present problems especially when policies and regulations are created or enforced using the Landscape Map.
6	The Plan does not provide goals and strategies focused on plan development for coordinated response to events threatening habitat and species (i.e. oil spill response, coastal storms, flood tides, fires, etc.). There are no partnerships with animal rehabilitators nor plans to evacuate endangered animals from such facilities during emergencies.
7	Under the goal to "Protect…unique habitats…" – please add North Jersey District Water Supply Commission to an area where natural communities will be mapped in a cooperative fashion.
8	"…a thorough consistency and funding analysis should be done and provided with the Plan to all stakeholders."
9	The background data and methodology supporting the GIS mapping determination of habitat speculated by the Plan should be thoroughly detailed and undergo independent confirmation for conclusions by neutral third party peers.
10	The Plan should require public approval for implementation where restrictions on land use will result.
11	The Plan should include partnerships with Quail Unlimited and farmers to manage and create lands for quail and other native species.
12	The Plan should include the evaluation of the benefits of beaver activities and the use of humane non-lethal means of mitigating conflicts where dams pose a risk to human structures.
13	Increase differential dog license from $3 to $25 to deter owners from not neutering their dogs.

G. Appendix VII: Prefaces developed for October 1, 2005, submittal; letters from former Commissioner Campbell and former Director McHugh

I. Preface

A. A letter from Commissioner Bradley M. Campbell

Accompanying this introductory letter is a remarkable document – the New Jersey Wildlife Action Plan (heretofore referred to as the Plan or WAP), a far-reaching blueprint for the protection and management of the wildlife species in our state that are most in need of conservation.

Every state was/is required to develop such a Plan that focuses on species of greatest conservation need during 2005 in order to qualify for federal funds through the State Wildlife Grants program. While the Plan focuses on special need species and describes the conservation work that will benefit those species, ultimately all fish and wildlife species in New Jersey will benefit from this work. An array of partners, including other government agencies, conservation groups, private landowners and other members of the public, helped develop the New Jersey WAP. It lays the foundation for better coordination of wildlife research and management among programs within the New Jersey Division of Fish and Wildlife, state and federal agencies and many partners in the conservation community.

As you review it, I believe you will agree with me that the Plan goes far beyond a basic outline. The WAP lays out the formidable challenges that today confront these important species in New Jersey and all those who care about them. In the most densely populated state in the nation, such challenges are inevitable.

Yet, as the WAP makes clear, particularly for a state its size, New Jersey is blessed with an incredible variety of natural resources and amazingly diverse ecosystems and wildlife communities. To protect them, the Department of Environmental Protection, our Division of Fish and Wildlife and the division's cutting-edge Endangered and Nongame Species Program (ENSP) cannot do the job alone. Fortunately, as the Plan also makes clear, we are blessed with a cornucopia of enthusiastic, dedicated partners and collaborators.

Indeed, for me the most noteworthy aspect of the Plan isn't just that, for the first time ever, it provides a comprehensive road map of what needs to be done for particular species, groups of species or particular habitats. It's that it identifies which people, agencies or organizations, whether inside or outside of state government – are best suited to execute each strategy. Not surprisingly, given the fact that this document itself is the product of extensive collaboration, in most cases the Plan calls for multiple collaborators to get involved – including the public.

Underpinning the Plan are seven core principles. These are:

1. Addressing Habitat Destruction
Habitat destruction, the greatest threat to New Jersey wildlife, is analogous to the "taking" or killing of wildlife since it denies organisms the capacities crucial to existence, such as the ability to successfully feed and/or reproduce. New Jersey is currently moving towards adopting

endangered and threatened species rules paralleling federal rules that protect both rare wildlife and their associated habitats.

2. Advancing Stewardship and Restoration
Another key focus of the WAP is managing lands for biodiversity. To this purpose, the WAP seeks dedicated funding for biodiversity land management on both public and private lands and solicits statewide application of *best management practices* to improve or maintain the ecological integrity of NJ's natural communities.

3. Continuing Sound, Science-based Wildlife Management
In order to control overabundant species where they occur, such as white-tailed deer, the WAP suggests a statewide, multi-organization effort to increase public education and awareness of the benefits that hunting of certain species has for all wildlife and natural communities.

4. Developing Government-wide Invasive Species Policy
Invasive species, both plant and animal, greatly threaten natural biodiversity and often out-compete and crowd out native species in the absence of natural controls. The WAP calls for concerted efforts to control invasive species and for the implementation of bioremediation plans to restore natural biodiversity to the New Jersey environment.

5. Implementing Recovery Plans for All Imperiled Species
In our role as good stewards of the land and flora and fauna that inhabit it, recovery plans for all endangered, threatened, and other rare species must be devised and implemented.

6. Continual Updates of Scientific Data and Geographic Information
Up-to-date scientific data and geographic information is the foundation of the WAP. To guide the Plan as it evolves through regular reviews and updates, we will rely upon habitat mapping, species surveys, and scientific modeling to determine the most critical habitats and wildlife in greatest conservation need.

7. Confronting Challenges in Urban Environments
As the nation's most densely populated state, New Jersey's urban environment presents unique challenges to the conservation and management of rare wildlife. The WAP addresses issues such as managing rare species that have become adapted to urban environments, identifying oases of urban wildlife habitat, restoring natural resources within urban environments, and minimizing impacts of contaminants and toxins to wildlife.

The WAP divides the state into five distinct physiographic landscape regions, and then further subdivides each of those regions into distinct zones delineated by watersheds and other geographic features. Once you locate the particular zone where you live or in which you are interested, you can read about:

- Key habitat features
- The wildlife of greatest conservation need found in those habitats
- Threats to this wildlife and the habitats upon which they depend
- Habitats
- Conservation goals

(Appendix VII continued)

- Conservation actions needed to achieve those goals
- Partners best suited to help achieve those goals
- How progress toward these goals will be monitored

New Jersey faces unprecedented wildlife conservation challenges to address habitat disturbances and destruction caused by widespread development, human activities, recreational vehicles, contaminants, and invasive and overabundant species. Fortunately, we have dedicated partners working with us to protect our resources including non-profit conservation groups and hunter and angler organizations among them. Moreover, we have worked diligently during the past 30 years to identify critical fish and wildlife species and habitats that have special conservation needs and to develop effective strategies to restore and conserve all of our fish and wildlife species.

Our Wildlife Action Plan ties together much of our wildlife data and management strategies so we can provide a brighter future for New Jersey's rare species and important habitats. It also offers New Jersey residents many new opportunities to play a role in wildlife conservation by volunteering to help biologists on research and management projects, through the use of habitat management applications on private lands and by supporting conservation actions and organizations that are key to this Plan's success. I invite everyone to review the Wildlife Action Plan and become involved in conserving New Jersey's wildlife in any way that you can.

Bradley M. Campbell
Commissioner
NJ Department of Environmental Protection

(Appendix VII continued)

B. A letter from Director Martin J. McHugh

In the past century the United States has had many tremendous wildlife management success stories. At the turn of the century, many of our common game species could have been considered endangered species candidates if an endangered species act had existed back then. The successes in wildlife management for game species and the foundation for all of our wildlife success stories, both nationally and here in New Jersey, flowed from an engaged and committed public of hunters, anglers and conservationists. At the core of this success has been the partnerships of state wildlife agencies working with federal natural resource agencies, national organizations and local groups to accomplish the science and put into place the programs we have today to conserve fish, wildlife and habitat.

One of the latest programs these partners helped initiate is State Wildlife Grants, which focuses on the more recent wildlife challenges involving non-game species, species that are dwindling due to habitat impacts and species that are at risk of becoming threatened and endangered. State Wildlife Grants is a program that provides federal funds to state wildlife agencies for the conservation of species of greatest conservation need. Initiated by Congress in 2000 under the original moniker of the "Wildlife Conservation and Restoration Program," State Wildlife Grants have provided over $400 million to state fish and wildlife agencies across the country to deliver on-the-ground conservation. Over the last six years, State Wildlife Grants has become the nation's core program for preventing wildlife from becoming endangered.

In New Jersey, the State Wildlife Grants provided through our partners at the United States Fish and Wildlife Service has significantly bolstered funding for our Endangered and Nongame Species Program which relied primarily on private contributions such as the income tax check-off and wildlife license plate sales. As a result of State Wildlife Grants, the Division of Fish and Wildlife has been able to put nearly $4 million into cutting edge wildlife diversity projects for the protection of species ranging from bald eagles to bog turtles and the preservation of habitats from the forests of northwest New Jersey to the marshes of Delaware Bay.

In accordance with the State Wildlife Grants Program, every state was required to submit a Comprehensive Wildlife Conservation Strategy to the USFWS by October 2005 for review and approval in order to qualify for future federal funds. This was a huge undertaking for every state including New Jersey and over the last year, the Division of Fish and Wildlife has worked hard to complete this Comprehensive Wildlife Conservation Strategy. However, in the course of finalizing the document, it has become clear that for it to be truly effective, it will never be truly complete. As with all wildlife programs and especially one geared towards "at risk" species, the management strategies must constantly be monitored and adjusted to adapt to changing conditions, new science and progress to objectives.

Consequently, this is a "living document" and while we are submitting this version to the USFWS by October 1, 2005, we are doing so with the understanding that we will continue to make revisions to the strategy on a regular basis. Therefore, we are extending the time for accepting comment during the federal review period and we will take those comments into consideration in developing the first revision to this ongoing strategy, which we plan to complete by late winter in 2006.

(Appendix VII continued)

The October submission of our Comprehensive Wildlife Conservation Strategy in conjunction with those of the 49 other states presents an exciting and unique moment in the history of wildlife management. For the first time, the 50 state strategies will provide a national picture and

blueprint for conservation action for wildlife with the emphasis on preventing wildlife from becoming endangered. This unprecedented nation-wide effort from the state's perspective will set forth plans for action in each state. In addition, when the strategies are viewed as a whole, regional and national issues and action needs will emerge. The strategies will therefore become a "call to action" in each state, regionally and nationally. In recognition, the conservation partners responsible for State Wildlife Grants have determined that following the historic submission of these 50 Comprehensive Wildlife Conservation Strategies, they will henceforth be referred to as the state's Wildlife Action Plans to reflect the dynamic, active and broad affect these will have in conjunction with existing wildlife management programs.

State Wildlife Action Plans will have a broad conservation affect for two primary reasons. First off, much of the conservation that results will benefit not only the species of greatest conservation need, but all wildlife species. Secondly, these Wildlife Action Plans are not just action plans for state wildlife agencies, but they are action plans for all agencies and organizations that have a desire or a need to contribute to conservation. The State Action Plans will leverage conservation actions from many conservation partners such as foundations, environmental and conservation groups, who participated in the action plan development and wish to have input into future revisions and implementation. Leveraging will also include current and new conservation partners ranging from the US Forest Service, USGS and state/federal departments of transportation as they all look to the Wildlife Action Plans for conservation options to fulfill their own program needs. Finally, the investment Congress made in the State Wildlife Grants Program will yield additional conservation dollars as funds are leveraged from other federal programs like the Farm Bill and from state match programs in every state.

The investment in New Jersey has already yielded a conservation return, as the State Legislature passed a bill to ensure adequate funding needed for our state match and the Governor signed it into law this summer. New Jersey Conservation organizations had a major role in making the case for providing this match and similar efforts will be undertaken in other states. We believe there will be further conservation returns as agencies and organizations look to our Wildlife Action Plan to address the threats to our state's important natural resources.

As our Wildlife Action Plan sets out, the greatest threats to New Jersey's wildlife include habitat loss, destruction, alteration, and fragmentation. This has been a recurring theme within our state for years as it is the most densely populated state in our nation with an annually increasing population requiring additional homes, roads, commercial buildings, schools, etc. Additional threats include, but are not limited to, invasive species (flora and fauna, aquatic and terrestrial), pollution, and unsustainable land management practices. To address these threats, the Wildlife Action Plan provides a common comprehensive conservation vision with guidance and specific actions for both long- and short-term management efforts that can be implemented by government and non-government agencies, conservation organizations, land stewards, and private landowners. The Wildlife Action Plan will guide partners in conservation in a cooperative effort to minimize the threats and improve habitat quality for NJ's wildlife species of greatest conservation need.

(Appendix VII continued)

New Jersey's Wildlife Action Plan lays the foundation for better coordination of wildlife research and management between the programs within the Division of Fish and Wildlife, state and federal agencies, and the many partners in the conservation community. Our Wildlife Action Plan and those of the other states present an opportunity - not to build a separate conservation model for all-species conservation - but to expand on a rich tradition and a winning formula by

broadening objectives, public engagement, and funding sources to address the greatest threats to our wildlife.

On behalf of the wildlife professionals at the Division of Fish and Wildlife, I would like to express our gratitude to all those who participated in the development of this historic Wildlife Action Plan. We look forward to the future input we hope to receive on our Wildlife Action Plan and the coordination with existing and new conservation partners as we begin to implement the Wildlife Action Plan upon its approval by the USFWS.

Martin J. McHugh
Director
NJ Division of Fish and Wildlife

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VIII. Attachments

Attachment A: Landscape Project

New Jersey's Landscape Project

NJ Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program
Wildlife habitat mapping for community land-use planning and endangered species conservation (Version 2.0)

New Jersey's Landscape Project

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Bradley M. Campbell, Commissioner
John S. Watson Jr., Assistant Commissioner

DIVISION OF FISH AND WILDLIFE

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Partnerships for Wildlife Act

NJ Department of Environmental Protection,
Division of Science, Research and Technology
Division of Watershed Management
Office of Natural Resource Damage Assessment

National Fish and Wildlife Foundation

Geraldine R. Dodge Foundation

Conserve Wildlife Foundation of NJ

The citizens of New Jersey who have purchased the Conserve Wildlife License Plate, checked-off for wildlife on their state income tax return or made a direct donation to the Endangered and Nongame Species Program (ENSP) or the Conserve Wildlife Foundation.

The following Division of Fish and Wildlife staff have contributed to the Landscape Project:
Larry Niles, ENSP Bureau Chief; James Sciascia, Information and Education Bureau Chief; Kathleen Clark, Principal Zoologist; David Jenkins, Principal Zoologist; Michael Valent, Principal Zoologist; Jeanette Bowers-Altman, Senior Zoologist; Amanda Dey, Senior Biologist; David Golden, Senior Biologist; Kris Schantz, Senior Biologist; Jason Tesauro, Senior Biologist; Melissa Craddock, Assistant Biologist; Sharon DeFalco, Assistant Biologist; Kimberly Korth, Assistant Biologist; Todd Pover, Assistant Biologist; Larissa Smith, Assistant Biologist; Brian Zarate, Assistant Biologist; William Bogetti, GIS Specialist; Gretchen Fowles, GIS Specialist; Peter Winkler, GIS Specialist; Patrick Woerner, GIS Specialist; Terry Terry, Head Clerk.

Maps and methodologies described in this document have been peer reviewed by:
Dr. James Applegate, Rutgers University; Dr. Joanna Burger, Rutgers University; Dr. Tim Casey, Rutgers University; Dr. David Ehrenfeld, Rutgers University; Dr. Joan Ehrenfeld, Rutgers University; Dr. David Fairbrothers, Rutgers University; Dr. Michael Gochfeld, Rutgers University; Ernie Hahn, DEP, Land Use Regulation Program; Dr. Colleen Hatfield, Rutgers University; Dr. Marjorie Kaplan, DEP, Division of Science, Research and Technology; Dr. Michael W. Klemens; Wildlife Conservation Society; Kim Laidig, NJ Pinelands Commission; Dr. Richard Lathrop, Rutgers University; Trish Maggio and Jessica Sanchez, NJ Office of State Planning; Dr. Peter Morin, Rutgers University; Larry Torok, DEP, Land Use Regulation Program; and Dr. Robert Zampella, NJ Pinelands Commission.

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Cover art by Steve Oleszek

Definitions

critical areas - any area ranked as "1" through "5" in the Landscape Project. See the following sections of this document for further information: "General Methodology for Delineating Critical Areas," "Detailed Methodology for Delineating Critical Areas by Habitat Type," and "Detailed Methodology for Delineating Critical Areas by Special Habitat Requirements."

endangered species - a species listed on the official endangered wildlife list that the Department promulgates pursuant to the Endangered and Nongame Species of Wildlife Conservation Act of 1973 (ENSCA).

imperiled species - includes all endangered and threatened wildlife species.

priority species - nongame wildlife that are considered by the Department to be species of special concern as determined by a panel of experts. The term also includes wildlife species of regional concern in regional conservation plans such as Partners in Flight Bird Conservation Plans, North American Waterbird Conservation Plans, United States Shorebird Conservation Plan, etc.

threatened species - a species designated as "threatened" on the list of nongame wildlife species that the Department promulgates pursuant to ENSCA.

Conversions

Area:

1 hectare = 2.47 acres

Distance:

1 meter = 3.28 feet

1 kilometer = 0.62 miles

The Landscape Project

a model for imperiled wildlife protection (Version 2.0)

New Jersey is the most densely populated state in the nation. One of the consequences of this distinction is the extreme pressure that is placed on our natural resources. As the population grows, we continue to lose or impact the remaining natural areas of the state. As more and more habitat is lost, people are beginning to appreciate the benefits — and necessity — of maintaining land in its natural state. For example, we now know that wetlands play an important role in lessening the damage from floods and naturally breaking down contaminants in the environment. Forests and grasslands protect the quality of our drinking water, help purify the air we breathe and provide important areas for outdoor recreation.

Collectively, these habitats are of critical importance to the diverse assemblage of wildlife found in New Jersey, including more than 70 species classified as threatened or endangered. In 1994, the New Jersey Department of Environmental Protection (DEP) adopted a landscape level approach to imperiled species conservation that was created by the Division of Fish and Wildlife's Endangered and Nongame Species Program. The goal is to protect New Jersey's biological diversity by maintaining and enhancing imperiled wildlife populations within healthy, functioning ecosystems.

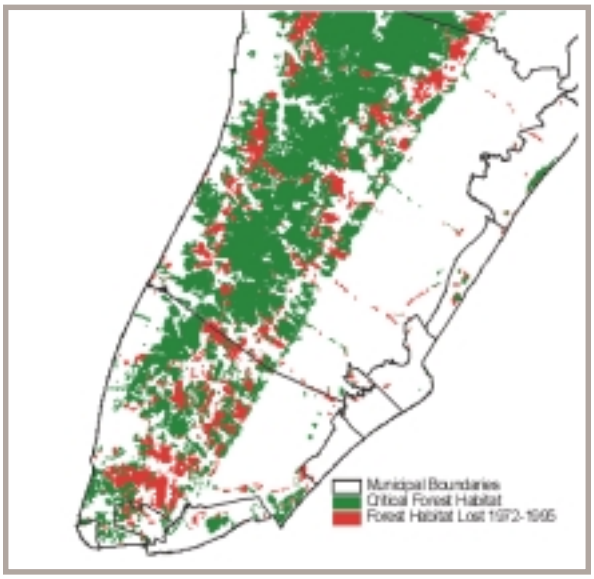


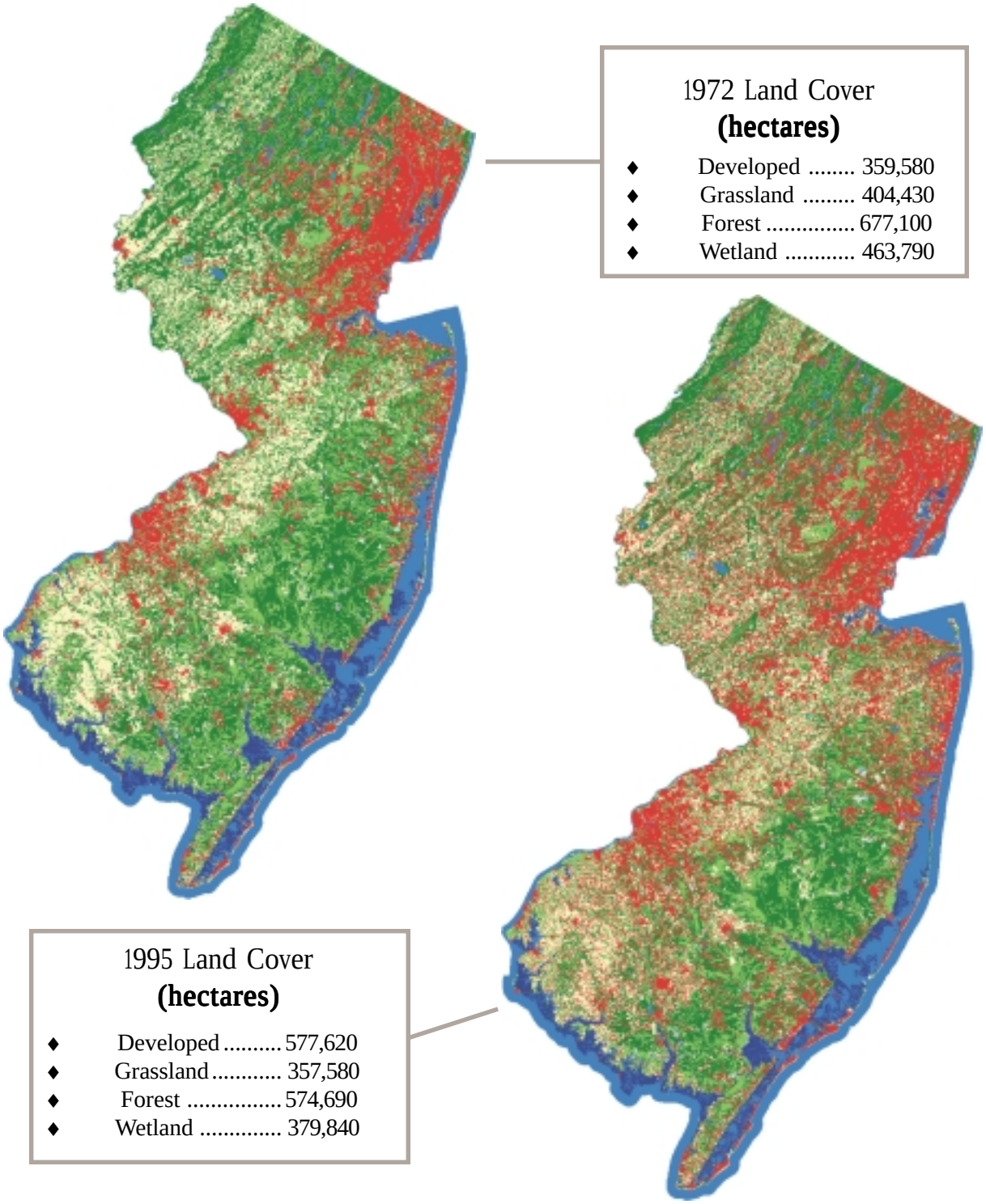
Figure 1. *Over 50% of the state's bog turtle habitat (top) and 40% of the Cape May Peninsula's migratory bird habitat (bottom) has been lost to sprawl in the past three decades. The Landscape Project aims to reverse this trend.*

Why we need the Landscape Project

As people leave our cities to live in the "country," suburban sprawl has consumed land at a rapid rate. Some analysts predict that at current patterns all remaining available land would be developed within 40 years, making New Jersey possibly the first state in the nation to reach build-out (Hasse and Lathrop 2001). In New Jersey, such sprawl is evident as analyses based on aerial photographs between 1985 and 1996 found that rural single unit residential growth was responsible for 30% of the new development in the state (Hasse and Lathrop 2001). See ***Appendix I*** for a discussion of habitat fragmentation.

Despite New Jersey's protection efforts, which include strict land-use regulations and an aggressive open space acquisition program (Green Acres), we continue to lose critical wildlife habitat at an alarming rate. In just the last three decades we have lost 40% of the remaining critical migratory bird stopover habitat on the lower third of the Cape May Peninsula. During the same period, approximately 50% of the state's bog turtle habitat has disappeared (***Figure 1***). The Landscape Project serves as a tool to help reverse this trend (***Figure 2***).

New Jersey's Changing Landscape



Data Sources: 1972 MSS imagery and 1995 TM imagery classified by Rutgers University Center for Remote Sensing and Spatial Analysis

Figure 2. *New Jersey's landscape is rapidly changing. Since 1972, more than 8,000 hectares/year of wildlife habitat has been lost. Moreover, much of the habitat that remains is less suitable for wildlife due to habitat fragmentation. This is especially detrimental to imperiled wildlife, as many of these species require large, contiguous blocks of habitat to survive. The goal of the Landscape Project is to reverse this trend by identifying, delineating and ultimately protecting habitat critical to the long-term survival of New Jersey's wildlife.*

The purpose of the Landscape Project

The Landscape Project has been designed to provide users with peer-reviewed, scientifically sound information that is easily accessible and can be integrated with planning, protection and land management programs at every level of government — state, county and municipal, as well as non-governmental organizations and private landowners. As in Version 1.0, Version 2.0 of the Landscape Project has gone through an extensive peer review process. Landscape maps and overlays provide a basis for proactive planning, such as the development of local habitat protection ordinances, zoning to protect critical wildlife areas, management guidelines for imperiled species conservation on public and private lands and land acquisition projects.

Most importantly, the critical area information that Landscape Project products provide can be used for planning purposes before any actions such as proposed development, resource extraction (eg. timber harvests) or conservation measures occur. Proper planning with accurate, and legally and scientifically sound information will result in less conflict. Less time will be wasted, and less money spent, attempting to resolve endangered and threatened species issues.

Uses for the Landscape Project

The ENSP has developed maps that identify critical areas for imperiled species based on land-use classifications and imperiled species locations. The maps will enable state, county, municipal and private agencies to identify important habitats and protect them in a variety of ways:

♦ **Prioritize conservation acquisitions:** Critical area maps can be used to prioritize land parcels for purchase through acquisition programs such as Green Acres, Farmland Preservation and the US Fish and Wildlife Service's refuge system .

♦ **Guide regulators and planners:** Critical area maps provide land-use regulators and state, county and local planners with the tools they need to enhance protection through the regulatory and planning process.

♦ **Provide citizens with conservation tools:** The Landscape Project provides the tools to guide citizen actions to protect imperiled species habitat at the local level. By combining critical area maps with other GIS data layers such as roads, development and publicly owned lands, important areas in need of protection can be easily identified.

♦ **Guide stewardship of conserved areas:** New Jersey already has more than 400,000 hectares of open space. These lands are managed by a variety of agencies and organizations, both public and private. Critical area maps identify important imperiled species habitats on these lands. ENSP biologists work hand in hand with land managers and landowners to develop appropriate best management practices for the long-term conservation of imperiled species.

Who benefits

Protecting large expanses of fields, forests and wetlands helps to ensure that imperiled species will remain a part of New Jersey's future (***Figure 3***). In addition to providing habitat for the conservation of imperiled species, the Landscape Project will result in more open space for outdoor recreation, as well as public health and additional environmental benefits. Recent surveys by the US Fish and Wildlife Service show that more than 60% of Americans participate in some form of wildlife-related recreation. Open spaces provide places where people can escape the confines of urban and suburban living. Retaining habitats in their natural state provides other benefits such as reducing the threat of flooding, allowing for the biodegradation of environmental contaminants and recharging ground water reserves. In short, everyone benefits from the Landscape Project.

Figure 3. *The Landscape Project aims to identify, delineate and ultimately protect critical areas for all New Jersey wildlife, including the bobcat, pictured above.*

New Jersey's Landscape Regions

A landscape level perspective

Since animals require large expanses of natural habitat for their long-term survival (***Appendix I***), the Landscape Project focuses on large areas called Landscape Regions that are ecologically similar with regard to their plant and animal communities (***Figure 4***). Utilizing an extensive database that combines imperiled and priority wildlife location information with land-use/land-cover classification data, ENSP has identified and mapped critical areas for imperiled species within each Landscape Region. These landscape maps provide a highly accurate, reliable and scientifically sound basis for habitat protection within each landscape.

One of the Landscape Project's unique features is its focus on the big picture, and not just on individual locations of imperiled species as those areas become threatened. Thus, within large landscapes, the Landscape Project identifies critical wildlife areas that must be preserved now if we want to assure the conservation of New Jersey's imperiled wildlife for future generations.

Skylands Landscape

This landscape encompasses all of Sussex, Warren, Hunterdon, Passaic and Morris counties and parts of Somerset and Bergen counties. The region contains extensive tracts of contiguous upland and wetland forests that support diverse animal populations including red-shouldered hawks, goshawks, cerulean warblers, timber rattlesnakes and long-tailed salamanders. Bog turtles and great blue herons inhabit the extensive freshwater wetland systems found throughout the region.

Delaware Bay Landscape

This landscape encompasses all or parts of Cape May, Atlantic and Cumberland counties. This area features a stable population of bald eagles, tiger salamanders, southern gray tree frogs and 30 other endangered and threatened species. The vast woodland tracts of this region are among the largest in the state and support a large portion of New Jersey's Neotropical bird populations. The extensive saltwater marsh and sandy overwash beaches support a shorebird migration that has worldwide ecological significance. Despite the heavy loss of habitat, the Cape May Peninsula remains one of the country's most important migratory "stopovers" for hundreds of bird and insect species.

Piedmont Plains Landscape

This landscape encompasses all or parts of Burlington, Gloucester, Mercer, Middlesex, Monmouth and Salem counties. It is dominated by the Delaware and Raritan rivers, and is characterized by farmed areas, extensive grasslands, fragmented woodlands and tidal freshwater marshes that are among the most productive in the world. Imperiled species within this landscape include grassland birds such as the endangered upland sandpiper, and woodland raptors such as the barred owl and Cooper's hawk.

Pinelands Landscape

This landscape encompasses all or parts of Atlantic, Ocean, Burlington, Camden and Gloucester counties. An internationally recognized ecosystem, the Pinelands supports extremely diverse reptile, amphibian and invertebrate populations including pine snakes, corn snakes, Pine Barrens treefrogs, Pine Barrens bluets, green darners and arogos skippers. Extensive cedar swamps and wetland systems contain numerous insect species, as well as sustainable populations of many Neotropical birds. Its waterways support aquatic communities unique among the Mid-Atlantic states.

Atlantic Coastal Landscape

This landscape encompasses parts of Monmouth, Ocean and Atlantic counties. New Jersey's Atlantic Coast beaches and marshes are among the most productive coastal habitats in the country. Despite heavy development, they support important portions of Atlantic Coast populations of colonial nesting birds, such as common terns, little blue herons and great egrets, and endangered beach-nesting birds such as least terns and piping plovers. The coastal habitats also support most of the state's ospreys and peregrine falcons, as well as a large number of northern harriers.

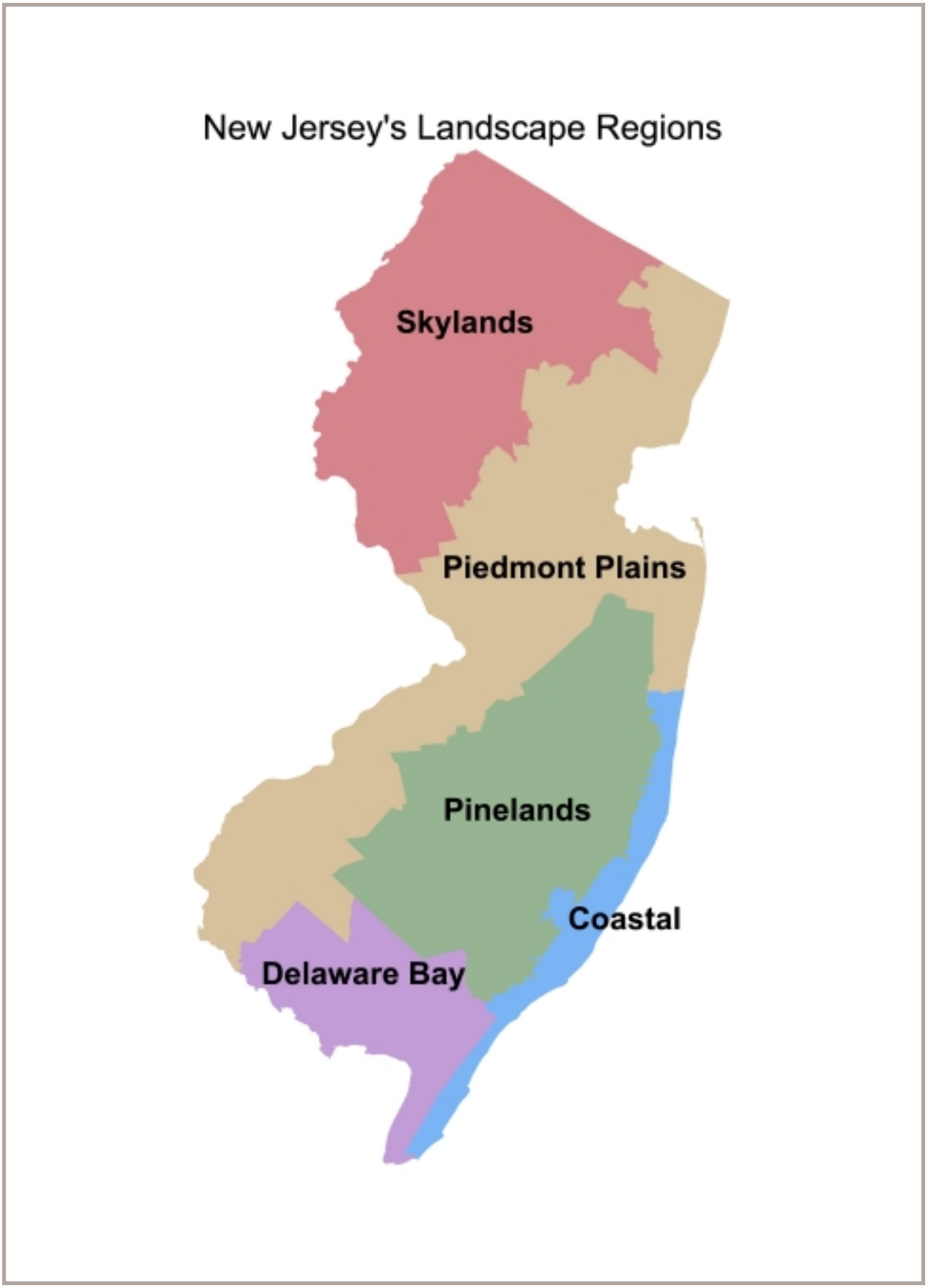


Figure 4. *New Jersey's Landscape Regions.*

Landscape Project Mapping

Methodology for Identifying and Delineating Critical Wildlife Areas

Data

Land Use/Land Cover: The land-use/land-cover data that formed the basis of Version 1.0 of the Landscape Project was a raster-based classification developed by Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA). This dataset was based on Landsat Thematic Mapper imagery that was enhanced with other ancillary data such as US Fish and Wildlife Service wetland maps, New Jersey Department of Environmental Protection (DEP) freshwater wetland maps and Natural Resource Conservation Service county soil maps. ENSP selected CRSSA's raster-based dataset (CRSSA LC) over the DEP's vector-based land-use/land-cover dataset (LU/LC) primarily because it could be easily updated to reflect the rapidly changing habitat conditions within New Jersey. Changes in land use and land cover have a profound influence on wildlife habitat and ENSP biologists wanted the ability to update the Landscape maps on a frequent basis.

In Version 2.0, the ENSP opted to use the DEP's air photo-based land-use/land-cover data primarily because of the desire for consistency with other geographic data and mapping applications that employ these data across the department. The increased resolution of the aerial photo-based data and the commitment by the DEP to update the 1995 data with 2002 imagery provided additional rationale for using the NJDEP LU/LC data.

DEP's Division of Science, Research and Technology conducted a study with ENSP, other DEP programs (Bureau of Geographic Information Systems; Office of Natural Lands Management; and the Forest Service) and Rutgers CRSSA in which detailed analyses of five geographic data sets that characterize New Jersey's diverse landscape were compared (Lathrop and Hasse 2003). This research revealed several important differences between the NJDEP LU/LC and the CRSSA LC datasets.

Vector-based polygon data is represented by individual points and the line segments that connect them. As a result, line segments can form irregular shapes of varying areas to accurately depict land features in detail. Raster layers are based on a regularly spaced grid with rectangular shaped cells. Since a cell can have only one value, classification involves calculating the land class that makes up the majority of the cell and assigning it that value. Since the cells cannot be divided the result is a jagged, less accurate border around each land-use type. Therefore, the vector-based data has the benefit of topological capabilities as well as database functionality that is better suited for regulation, planning and management applications (***Figure 5***).

In addition, the NJDEP LU/LC was created from visual photo-interpretation and therefore is able to use shape, pattern and context to accurately map land features in detail. The CRSSA LC uses spectral reflectance values to differentiate land covers. Many factors can influence the accuracy of this technique such as climatic conditions, seasonal variation and heterogeneity of spectral signatures for particular land covers.

The NJDEP LU/LC classifies land use and land cover by assigning one of 66 classes described in Anderson et al. (1976). CRSSA LC uses a classification that is based on the physical material covering the earth's surface. Consequently, some areas are classified differently by the two methods. For example, lawn areas in parks are classified by the NJDEP LU/LC as developed. CRSSA LC classifies the same area as grasslands. Due to these differences some of the LU/LC classes had to be modified to include known wildlife habitat (***Appendix II***).

Wetlands also are treated differently by the two systems and may result in different classifications for similar land types. For example, the NJDEP LU/LC classifies wet hayfields as wetlands due to their regulatory status, but CRSSA LC may classify the same area as grasslands.

Mapping resolution and precision of the NJDEP LU/LC maps is slightly improved in comparison to the CRSSA-derived maps, and the ENSP based its decision to use the NJDEP LU/LC on these factors. However, because some of the species models (eg. bald eagle foraging and colonial waterbird foraging) were developed for Version 1.0, they are calculated using raster-based data and then converted to a vector-based polygon for inclusion in the Landscape Project.

For complete details on New Jersey 1995/97 Land Use/Land Cover Update Project consult the DEP's Web site at:

http://www.nj.gov/dep/gis/supfiles.html

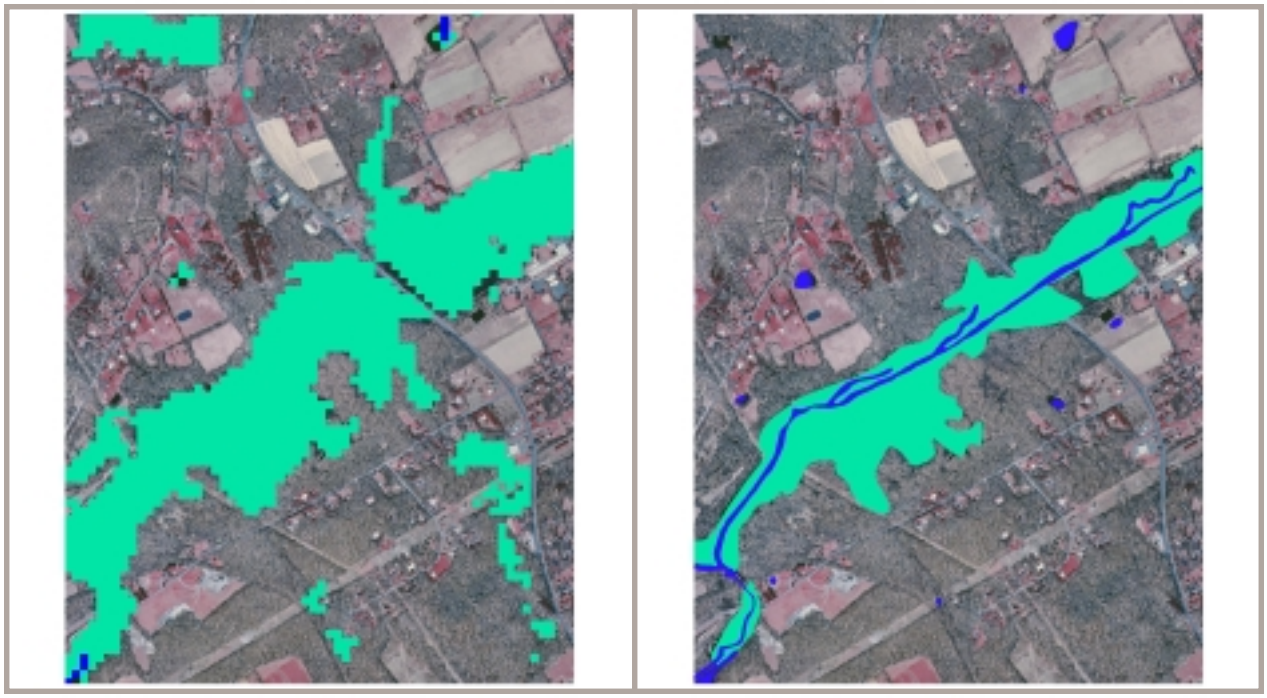


Figure 5. *A comparison of raster-based data (left) versus vector-based data (right). Note the jagged boundary of the raster-based habitat polygon compared to the smooth boundary of the vector-based habitat polygon.*

Species Data: Documented occurrences of imperiled species are used to determine critical areas. The majority of the species data used in the Landscape Project are taken directly from the Natural Heritage Program's (NHP) Biological Conservation Database (BCD) GIS coverage. Wildlife records in the BCD are derived from a variety of sources. These include ENSP surveys, DEP staff reports, private consultant reports and reports from the general public. ENSP staff is responsible for verifying all submitted records prior to acceptance (***Appendix III***). All verified sightings are mapped on 1:24000 USGS 7.5' topographic maps or the most recent color infrared aerial imagery by a staff biologist prior to entry into the BCD. Only seconds precision records (mapped to within one second of latitude and longitude) with a last observation date of 1970 or later are used to delineate and classify critical areas.

Models are applied to all species data that are used to generate the Landscape Project critical area maps (***Appendix IV***). Some models were developed based on home range/territory sizes reported in the scientific literature. Other species models consist of polygons having an area equivalent to one second of latitude and longitude with the actual sighting location at the center, or a digitized polygon that represents the habitat used by the species as defined in the NHP's Element Occurrence Specification Standards.

General Methodology for Delineating Critical Areas

The method for delineating critical areas is relatively straightforward. First, the relevant classes for each habitat type (forest, grassland, forested wetland, emergent wetland and beach) are extracted from the NJDEP's LU/LC data layer. Dissolving the different LU/LC classes for each habitat type creates contiguous habitat polygons. Using boundaries between habitat types and major roads (county level 500 and above), contiguous patches for each habitat type are delineated. Each patch is then assigned a unique link ID. Imperiled species models are then intersected with habitat patches. Habitat patches are classified based on the status of the species present as follows (***Figure 9***):

- **Rank 5** is assigned to patches containing one or more occurrences of at least one wildlife species listed as endangered or threatened on the Federal list of endangered and threatened species.
- **Rank 4** is assigned to patches with one or more occurrences of at least one State endangered species.
- **Rank 3** is assigned to patches containing one or more occurrences of at least one State threatened species.
- **Rank 2** is assigned to patches containing one or more occurrences of at least one non-listed State priority species.
- **Rank 1** is assigned to patches that meet habitat-specific suitability requirements such as minimum size criteria for endangered, threatened or priority wildlife species, but that do not intersect with any confirmed occurrences of such species.

See ***Figure 6*** for a statewide distribution of habitat by landscape region and ***Figure 7*** for a statewide distribution of critical areas (rank 3,4,5) by landscape region.

Detailed Methodology for Delineating Critical Areas by Habitat Type

Forest: Critical area maps for forest-dependent species are generated by selecting specific land-use classes from the NJDEP's LU/LC data set. See ***Appendix V*** for a list of DEP land-use classes and the corresponding habitat types. Using GIS software, the ENSP has developed the following protocols (***Figure 8***):

Outside of the Pinelands

- Extract all appropriate forest types (upland and wetland forests) from the NJDEP LU/LC dataset into one forest layer (***Appendix IV***).
- Combine all of the NJDEP LU/LC forest types that are directly adjacent to one another by dissolving the boundaries between them making a layer of contiguous forest polygons.
- Bisect the resulting forest coverage using major roads (500 level and above) to create ecologically significant boundaries between contiguous forest patches.
- Clip the resulting forest coverage by the Pinelands Area Boundary of New Jersey.
- Identify these patches and sections of patches as Pinelands Area patches.

For Pinelands Area patches proceed to protocol under the subheading "Pinelands." For forest patches outside of the Pinelands Area continue below:

- Identify forest patches that have a core area of 10 hectares or greater. Core area is defined as interior forest greater than 90 meters from the forest edge.
- Buffer all forest patches inward from the perimeter by 90 meters.
- Erase this buffer from each patch.
- If the sum of the remaining area is 10 hectares or greater, then the original patch is recoded as core. These patches receive a minimum rank of 1.

- Combine the Pinelands Area patches and sections of patches with the remaining forest patches that are directly adjacent to one another by dissolving the boundaries between them making a layer of contiguous forest polygons.
- Assign each new patch a unique Link ID used for tracking patches.
- Intersect forest species models with the new forest layer. This intersection results in a new layer with the Link ID from the forest layer and an ID from the species models. From this layer queries can be made to determine the number of records and conservation status of each patch based on the species present.
- All forest patches in the Coastal Landscape Region and the lower 10 kilometers of the Cape May peninsula are considered critical areas due to the importance of these habitats to migrating birds. These patches receive a minimum rank of 1 regardless of whether or not they contain 10 hectares of core forest.
- Habitat patches are classified based on the conservation status of the species present as detailed in the "General Methodology for Delineating Critical Areas," section.

Pinelands

- Identify Pinelands Area connection corridors. Pinelands Area patches connected by any corridor that is greater than 91.44 meters in length and less than 91.44 meters wide are considered separate patches.
- Buffer all forest patches inward from the perimeter by 45.73 meters. This action eliminates all Pinelands connecting corridors that do not meet the required dimensions.
- Pinelands Area patches that meet the required dimensions are buffered outward from the perimeter by 45.73 meters and merged with any overlapping forest polygons. This buffer brings the forest patch back out to its original extent minus Pinelands connection corridors that do not meet the required dimensions.
- Identify Pinelands Area patches that have a core area of 10 hectares or greater. Pinelands core area is defined as contiguous interior forest greater than 90 meters from the forest edge.
- Buffer all forest patches inward from the perimeter by 90 meters.
- Erase this buffer from each patch.
- If a contiguous section of the remaining area is 10 hectares or greater, then the original patch is re-coded as core and receives a minimum rank of 1.
- Combine the Pinelands Area patches and sections of patches with the remaining forest patches that are directly adjacent to one another by dissolving the boundaries between them making a layer of contiguous forest polygons.
- Assign each new patch a unique Link ID used for tracking patches.
- Intersect forest species models with the new forest layer. This intersection results in a new layer with the Link ID from the forest layer and an ID from the species models. From this layer queries can be made to determine the number of records and conservation status of each patch based on the species present.
- All forest patches in the Coastal Landscape Region and the lower 10 kilometers of the Cape May peninsula are considered critical areas due to the importance of these habitats to migrating birds. These patches receive a minimum rank of 1 regardless of whether or not they contain 10 hectares of core forest.
- Habitat patches are classified based on the conservation status of the species present as detailed in the "General Methodology for Delineating Critical Areas," section.

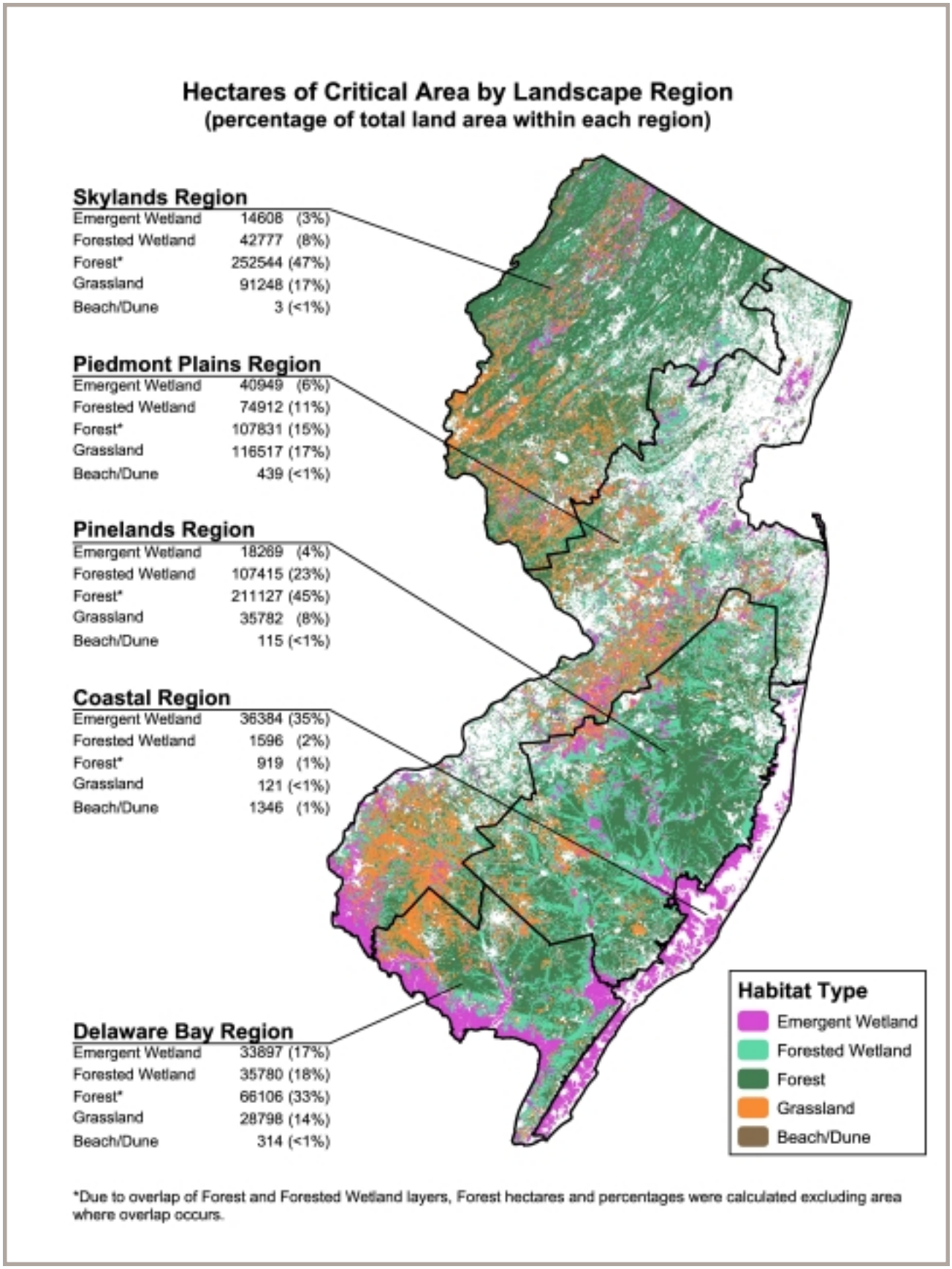


***Figure 6**. Hectares of each habitat type expressed as a percentage of the total land area within each Landscape Region.*

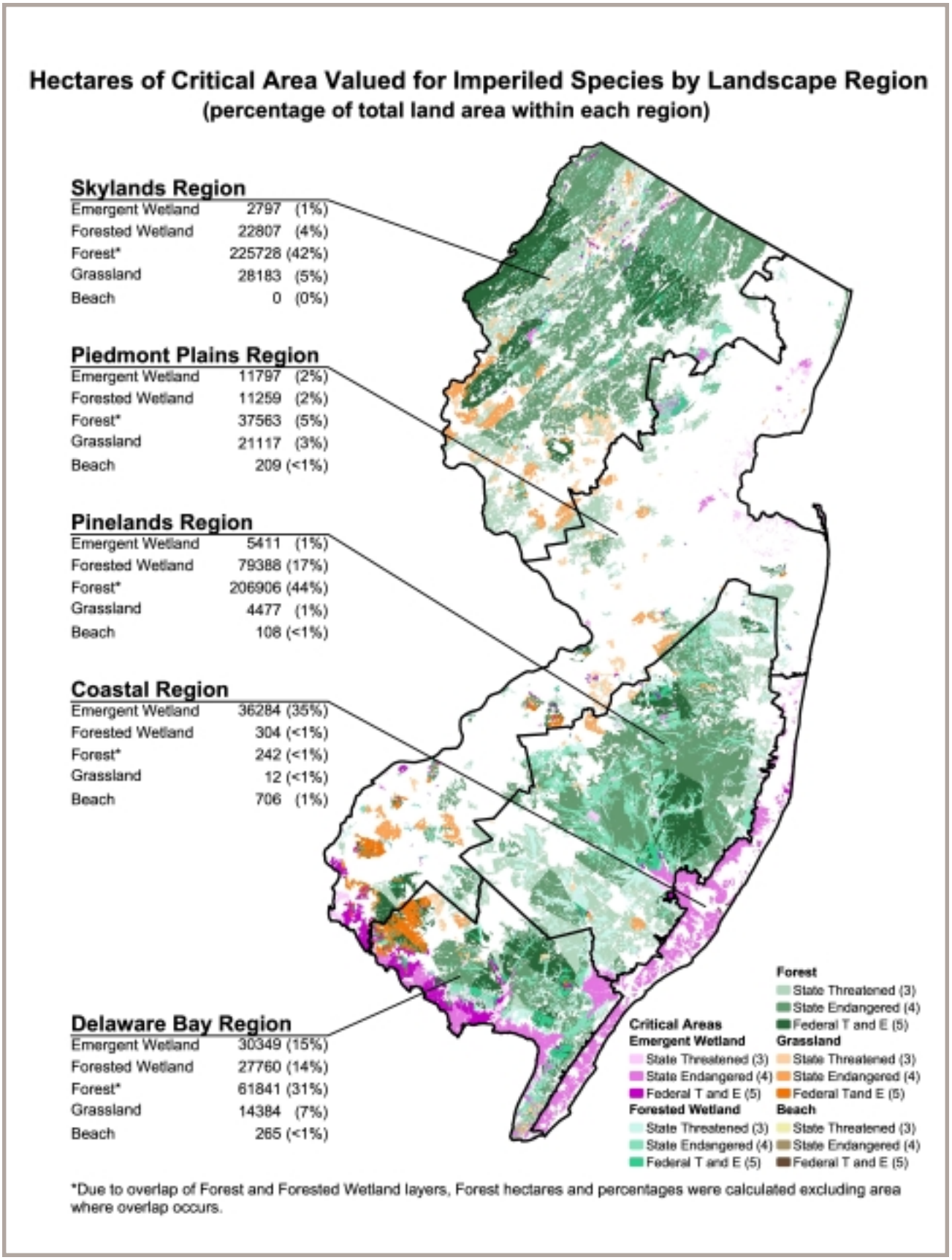


***Figure 7**. Total hectares of critical area by habitat type within each Landscape Region.*

Forested Wetland: Critical area maps for forested wetland dependent species are generated by selecting specific land-use classes from the NJDEP's LU/LC data set. See ***Appendix V*** for a list of DEP land-use classes and the corresponding habitat types. Using GIS software, the ENSP has developed the following protocol:

- Extract all appropriate forested wetland types from the NJDEP's LU/LC data set into one forested wetland layer (***Appendix V***).
- Combine all of the NJDEP LU/LC forested wetland types that are directly adjacent to one another by dissolving the boundaries between them making a layer of contiguous forested wetland polygons.
- Bisect the resulting forested wetland coverage with major roads (500 level and above) to create ecologically significant boundaries between contiguous forested wetland patches.
- Assign each new patch a unique Link ID used for tracking patches.
- All forested wetland patches are considered critical areas regardless of size. Therefore, all forested wetland patches receive a minimum rank of 1.
- Intersect forested wetland species models with the new forested wetland layer. This intersection results in a new layer with the Link ID from the forested wetland layer and an ID from the species models. From this layer queries can be made to determine the number of records and conservation status of each patch based on the species present.
- Habitat patches are classified based on the conservation status of the species present as detailed in the "General Methodology for Delineating Critical Areas," section.

Emergent wetland: Critical area maps for emergent wetland dependent species are generated by selecting specific land-use classes from the NJDEP's LU/LC data set. See ***Appendix V*** for a list of DEP land-use classes and the corresponding habitat types. Using GIS software, the ENSP has developed the following protocol:

- Extract all appropriate emergent wetland types from the NJDEP's LU/LC land-use/land-cover data set into one emergent wetland layer (***Appendix V***).
- Combine all of the NJDEP LU/LC emergent wetland types that are directly adjacent to one another by dissolving the boundaries between them making a layer of contiguous emergent wetland polygons.
- Bisect the resulting emergent wetland coverage with major roads (500 level and above) to create ecologically significant boundaries between contiguous emergent wetland patches.
- Assign each new patch a unique Link ID used for tracking patches.
- All emergent wetland patches are considered critical areas regardless of size. Therefore, all emergent wetland patches receive a minimum rank of 1.
- Intersect emergent species models with the new emergent wetland layer. This intersection results in a new layer with the Link ID from the emergent wetland layer and an ID from the species models. From this layer queries can be made to determine the number of records and conservation status of each patch based on the species present.
- Habitat patches are classified based on the conservation status of the species present as detailed in the "General Methodology for Delineating Critical Areas," section.

Grassland: Critical area maps for grassland dependent species are generated by selecting specific land-use classes from the NJDEP's LU/LC data set. See ***Appendix V*** for a list of DEP land-use classes and the corresponding habitat types. Using GIS software, the ENSP has developed the following protocol :

- Extract all appropriate grassland habitat types from the NJDEP's LU/LC data set into one grassland layer (***Appendix V***).
- Combine all of the NJDEP LU/LC grassland types that are directly adjacent to one another by dissolving the boundaries between them making a layer of contiguous grassland polygons.

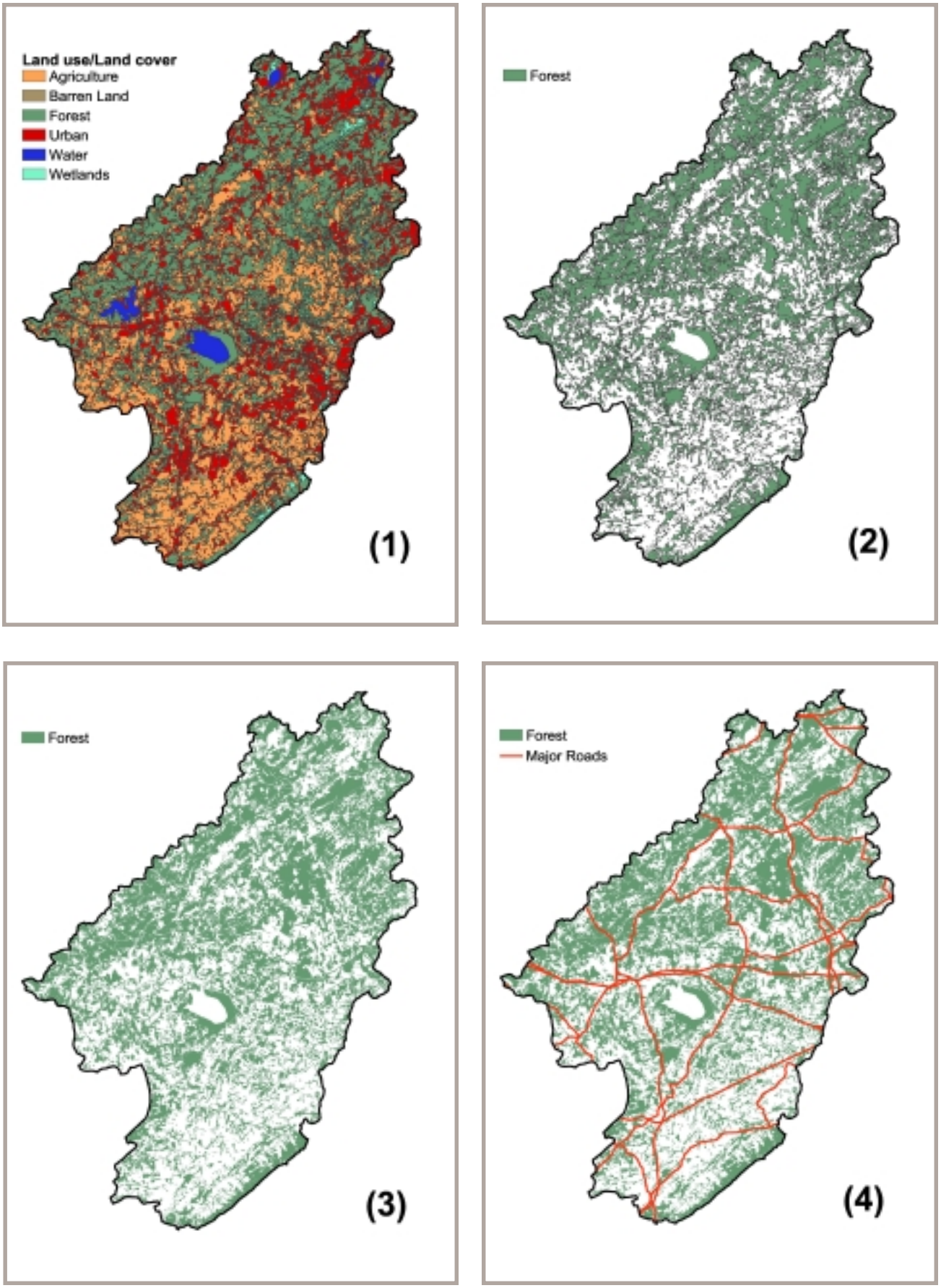


Figure 8. *A multistep process is used to delineate critical forest areas in North and South Branch Raritan Watershed Management Area. (1) NJDEP's 1995/1997 land-use/land-cover types. (2) Extract all forest types from the land-use/land-cover data. (3) Contiguous patches are created by dissolving boundaries between adjacent forest polygons. (4) Bisect contiguous forest patches using major roads to create ecologically significant boundaries.*

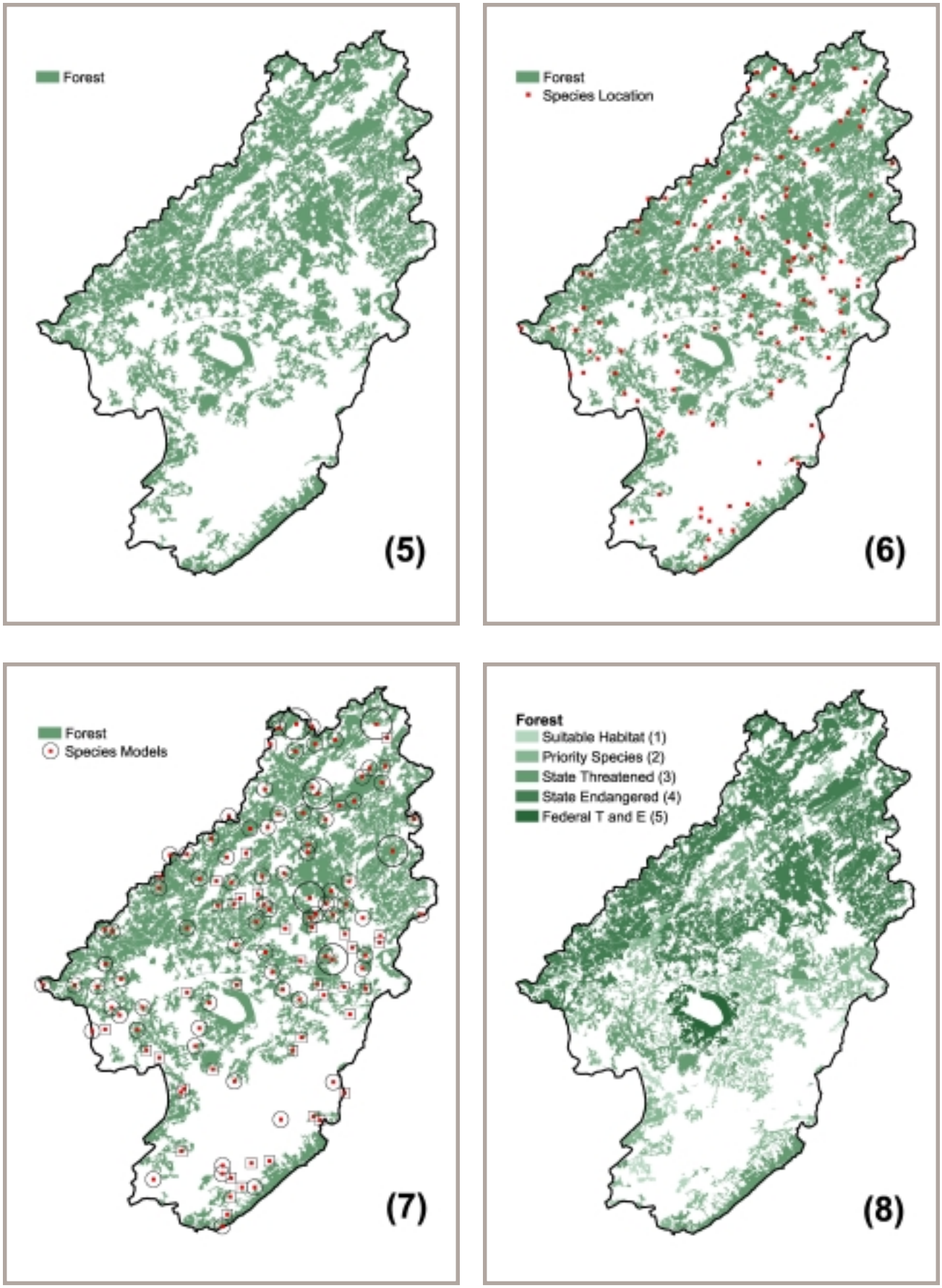


Figure 8 (Cont.). *(5) Select forest patches meeting the minimum core size. (6) Overlay species point locations on the forest coverage. (7) Intersect species models with the forest patches. (8) Rank habitat patches based on the conservation status of species present.*

- Bisect the resulting grassland coverage with major roads (500 level and above) to create ecologically significant boundaries between contiguous grassland patches.
- Assign each new patch a unique Link ID used for tracking patches.
- Select all grassland patches greater than 18 hectares. These patches meet the minimun size requirement for grasslands and receive a minimum rank of 1.
- All grassland patches in the lower 10 kilometers of the Cape May peninsula are considered critical areas. This is due to the importance of this habitat to migrating birds. These patches receive a minimum rank of 1 regardless of whether or not they contain 18 hectares of core.
- Intersect grassland species models with the new grassland layer. This intersection results in a new layer with the Link ID from the grassland layer and an ID from the species models. From this layer queries can be made to determine the number of records and conservation status of each patch based on the species present.
- Habitat patches are classified based on the conservation status of the species present as detailed in the "General Methodology for Delineating Critical Areas," section.

Beach: Critical area maps for beach dependent species are generated by selecting specific land-use classes from the NJDEP's LU/LC data set. See ***Appendix V*** for a list of DEP land-use classes and the corresponding habitat types. Using GIS software, the ENSP has developed the following protocol :

- Extract the beach habitat type from the NJDEP's LU/LC data set. Only one beach class exists in the data set (***Appendix V***).
- Beach habitats are bisected by natural breaks such as inlets and rivers and by hand digitized boundaries around species locations.
- Assign each new patch a unique Link ID used for tracking patches.
- All beach patches are considered critical areas regardless of size. Therefore, all beach patches receive a minimum rank of 1.
- Intersect beach species models with the new beach layer. This intersection results in a new layer with the Link ID from the beach layer and an ID from the species models. From this layer queries can be made to determine the number of records and conservation status of each patch based on the species present.
- Habitat patches are classified based on the conservation status of the species present as detailed in the "General Methodology for Delineating Critical Areas," section.

Detailed Methodology for Delineating Critical Areas by Special Habitat Requirements

For some species, additional specific mapping protocols were developed and are set forth below.

Bald Eagle Foraging Area: All known bald eagle nests are recorded using GPS equipment. To run the model, all water polygons from the DEP LU/LC having an area greater than 8 hectares are converted to a 5-meter grid. A radius around the nest site is incrementally increased, one cell (5 meters) at a time, until an area of 660 hectares of open water has been identified. All emergent wetland patches within 90 meters of the identified water are selected. The emergent wetland patches are merged with the identified open water. A 90-meter buffer is applied to the combined water/emergent wetland layer to protect perching sites. In the previous version (1.0) all habitat patches that intersected with the foraging habitat and 90-meter buffer were designated as critical areas. In Version 2.0 bald eagle foraging habitat, and its associated 90-meter buffer, is no longer used to value patches that intersect with it. The bald eagle foraging model is a stand-alone GIS layer that is not used to value habitat patches.

Peregrine Falcon: In Version 1.0 of the Landscape Project, emergent wetland patches that intersected a

1-kilometer radius area delineated around a peregrine falcon nest were valued as peregrine falcon habitat.

In Version 2.0, peregrine falcon nests are separated into two types, urban and non urban depending on the type of landscape in which they are located. For urban nests a 1-kilometer radius area around the nest is now valued as peregrine falcon habitat regardless of the land-cover type. Urban peregrine nests continue to value emergent wetland patches that intersect with the 1-kilometer radius area delineated around a peregrine falcon nest. Non-urban peregrine falcon nests continue to value only emergent wetland patches that intersect with the 1-kilometer radius area around the nest. The urban peregrine falcon model is a stand-alone GIS layer that values emergent wetland habitat patches.

Wood Turtle: Critical areas for wood turtles are mapped following a four-step process.

A 1.6-kilometer radius is placed around each wood turtle sighting location in the BCD. A 322-meter buffer is then applied to all streams that fall within the 1.6-kilometer radius. The NJDEP LU/LC is then overlaid on the buffered areas and all areas classified as urban, with the exception of powerline rights-of-way, are deleted from the buffer. DEP Freshwater Wetland Maps are overlaid on the stream buffers, and all wetlands that intersect the buffer are clipped within the 1.6-kilometer radius and are merged into the stream/buffer polygon. The final step of the process involves a detailed quality-control check and revision of each polygon to ensure biological accuracy. The wood turtle model is a stand-alone layer that is not used to value habitat patches.

The two principal differences between Version 1.0 and 2.0 are as follows: In Version 2.0, streams classified as 1st order or greater are included, while in Version 1.0 only streams classified by DEP as 2nd order and greater were included. This change was made based upon additional analysis following release of Version 1.0 that revealed a large number of documented wood turtle occurrences were on DEP 1st order streams, which were suitable for wood turtles.

In Version 2.0, only the identified wetlands together with the streams and stream buffers constitute wood turtle habitat, while in Version 1.0 any patches of upland forest, forested wetland, emergent wetland and grassland that intersected with the wetland and stream buffers were valued as wood turtle habitat. This change was made to limit the delineated habitat to those areas closest to suitable streams because the approach used in Version 1.0 included areas too distant from streams to be considered suitable for wood turtles. As a result of applying both of these changes, Version 2.0 values significantly less area as wood turtle habitat than Version 1.0.

Technical Information

Critical area maps are in ArcView shapefile format and projected to NJ State Plane feet, datum NAD 83, zone 4701. The maps are best viewed using ArcView 3.x or ArcGIS 8.x. These software products allow the user full functionality for viewing and manipulating critical area data. Non-GIS users can view the maps using ArcExplorer, a free GIS data browser that can be downloaded from the ESRI Web site (http://www.esri.com/software/arcexplorer/aedownload.html). ArcExplorer allows the user to view GIS data, zoom in and out, perform simple queries and print maps.

How to get critical area maps: Landscape Project data is available via download or viewing from the following DEP Web sites:

- http://www.nj.gov/dep/fgw/ensp/landscape/index.htm
- www.njfishandwildlife.com
- Interactive i-MapNJ Web site: http://www.state.nj.us/dep/gis/imapnj/imapnj.htm

or by contacting:

New Jersey's Landscape Project
Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program
PO Box 400
Trenton, NJ 08625-0400
Phone:(609) 292-9400
Fax:(609) 984-1414

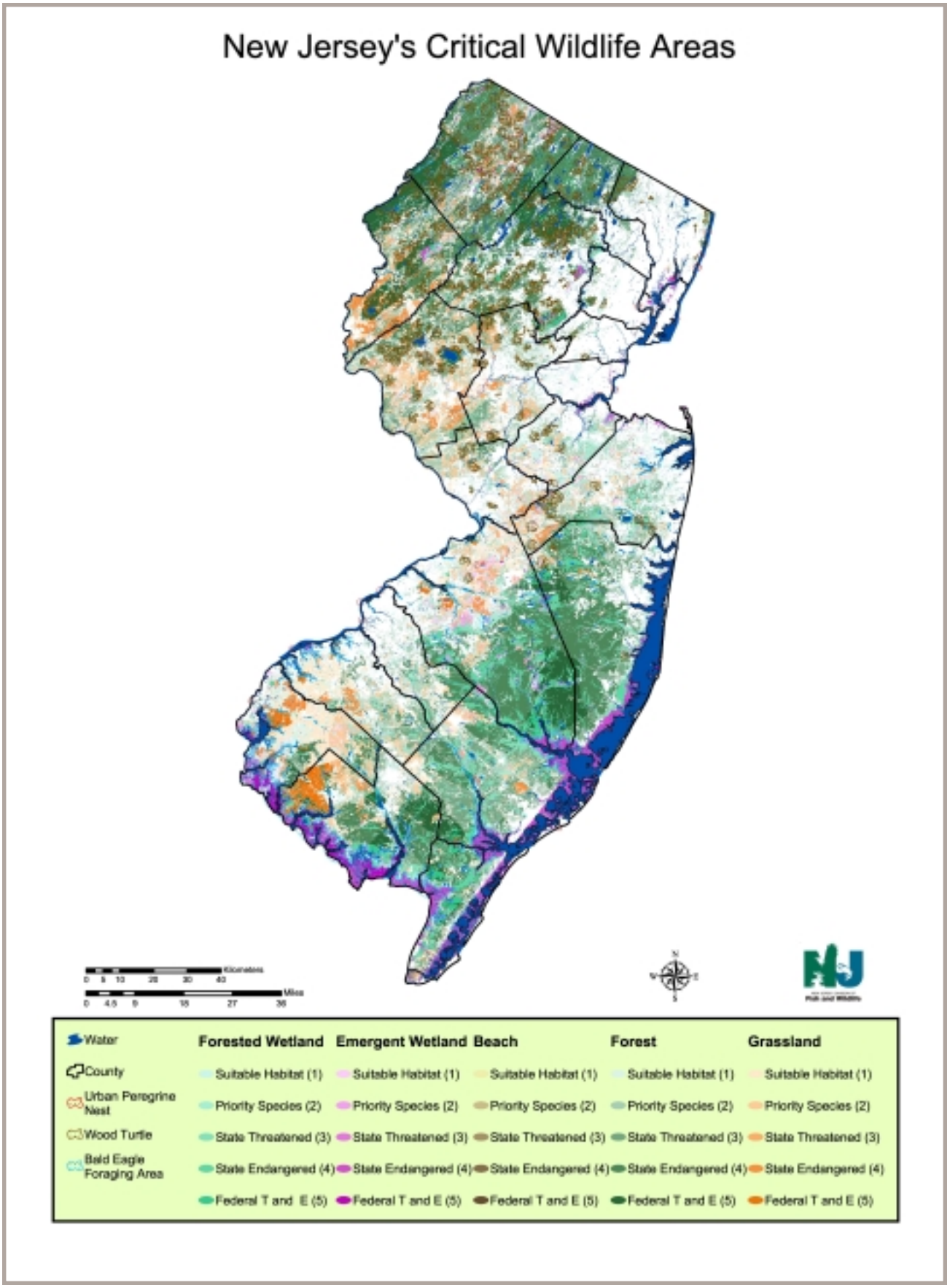


Figure 9. *New Jersey's critical wildlife areas are color coded based on habitat type (forest, forested wetland, emergent wetland, grassland and beach), with lighter to darker shades depicting the rank of patches.*

Appendices.

Appendix I. Habitat Fragmentation and Area Sensitivity

Definitions:

Priority species- means nongame species that are considered by the DEP to be species of special concern as determined by a panel of experts. The term also includes species of regional concern in regional conservation plans such as Partners in Flight Bird Conservation Plans, North American Waterbird Conservation Plan, United States Shorebird Conservation Plan, etc.

Habitat Fragmentation- the process of converting a large, continuous patch of a similar vegetation type into smaller patches of different vegetation types in a way that only scattered remnants of the original vegetation type remains (Faaborg et al. 1995).

Forest-interior birds

Many of the bird species of special or regional concern are forest-interior birds, that is, birds that nest within the interior core of a forest patch (area of forest greater than 90 meters from an edge) (Faaborg et al. 1995). Many forest-interior species are Neotropical migrants that breed in temperate North America and overwinter in the tropics of Central and South America (the "New World" or "Neotropics"). Many resident and short-distance migrant species also require forest interior to breed successfully. Forest-interior birds, as a group, are declining because of loss and fragmentation of forested breeding habitat in North America (from urban sprawl) and wintering habitat in South America; the majority are area sensitive and negatively impacted by forest fragmentation (Table 1). When a forest is fragmented, the abundance of avian and mammalian predators often increases, as well as the frequency of brood parasitism, both of which result in lower nesting success. Forest fragmentation also facilitates the spread of exotic and invasive species, both vegetative and mammalian, that can dramatically change the habitat structure of the forest, affecting the abundance and availability of food and nest sites (DeCalesta 1994, Burke and Nol 1998, McCollin 1998, Hansen et al. 2002).

Grassland Birds

Grassland birds, which are mainly short-distance migrants, have experienced severe population declines throughout the United States and constitute a sizeable proportion of birds listed as special or regional concern. The decline of agriculture, change to mechanized agriculture, and introduction of cool-season grasses in the Northeast have resulted in a fundamental shift in the character of grassland habitats. Loss and conversion of agricultural habitats to development has fragmented farmland into small, isolated patches that cannot support grassland-dependent birds (Bollinger and Gavin 1992). Furthermore, mechanized agriculture with frequent/early mowing causes direct mortality to adult and juvenile birds, and row-crop agriculture does not produce suitable breeding and foraging habitat for most grassland species.

Area Sensitivity

Neotropical migrant birds as a group, and species that prefer forest-interior habitat, tend to be more area sensitive (Whitcomb et al. 1981). In their literature review, Mitchell et al. (2000) found clear documentation of the area sensitivity of more than nine grassland bird species.

Area-sensitive species require a minimum amount of interior, or "core", habitat for successful breeding, and this minimum can vary depending on the habitats in the surrounding matrix. For grassland species, core habitat is the grassland habitat at least 50 meters inward from the grassland edge. For forest species, core habitat is the forest habitat at least 90 meters inward from the forest edge. The minimum core required to provide suitable breeding habitat for area-sensitive species is 10 hectares of forest core and 18 - 50 hectares of grassland core, (Dawson et al. 1993, Franklin 1993, Vickery et al. 1994, Faaborg et al. 1995, Collinge 1996, Dawson et al. 1998). The minimum area required to support breeding of one of the least area-sensitive grassland species (savannah sparrow) is 10 ha. of core habitat, whereas upland sandpipers require habitat in the range of 200 ha. to support a breeding population (Vickery et al. 1994). Area-sensitive birds tend

not to occur in forests and grasslands, respectively, that lack core habitat (McCollin 1998, Forman et al. 2002).

The creation of "edge" habitat, resulting from fragmentation of a forest patch, changes the microhabitat of that edge zone so that it is different from the neighboring forest some distance into the interior (Saunders et al. 1991, Murcia 1995, Collinge 1996). More sunlight and wind reach the edge of a forest, thus increasing the local temperature, decreasing humidity, and affecting the local plant community with an increase in invasive exotic species (Murcia 1995, Collinge 1996, Primack 1998). This change in the local climate also can increase the chance of fire (Faaborg et al. 1995, Primack 1998) and adversely affect nesting success and food availability in the forest patch (Burke and Nol 1998, McCollin 1998).

Many forest-interior bird species tend to avoid nesting in forest edges (Hoover et al. 1995, Collinge 1996, McCollin 1998, Miller et al. 1998, Villard et al. 1999, Forman et al. 2002). The presence of a forest edge introduces more generalist species to the area that compete for foraging and nest sites. A forest edge provides favorable conditions for mammalian and avian predators to increase in number and type (Hoover et al. 1995, Murcia 1995, Collinge 1996, McCollin 1998, Faaborg et al. 2002). The number of brown-headed cowbirds (a brood parasite) also increases in forest edges, further reducing nesting success of forest birds (Brittingham & Temple 1983, Robinson et al. 1995, Collinge 1996, McCollin 1998, Primack 1998). Kilgo et al. (1998) found the probability of occurrence of prothonotary warblers, northern parulas, white-eyed vireos, kentucky warblers, and yellow-billed cuckoos to significantly increase ($P<0.05$) with core area. Of these species, the yellow-billed cuckoo and prothonotary warbler were the most sensitive to the amount of core habitat. Villard et al. (1999) found that the hairy woodpecker, least flycatcher, and veery are unlikely to occur in areas with increased edge.

In addition to habitat selection and overall productivity of bird species, the size of a habitat patch affects richness and abundance of species (Forman and Godron 1981, Robbins et al. 1989, Askins et al. 1990, Murcia 1995, Collinge 1996, Golden and Crist 2000, Summerville and Crist 2001). As the degree of forest fragmentation increases, and forest patches become smaller and more isolated, fewer area-sensitive species are present (low species richness). As a result, species assemblages become more unstable, with different species moving in and out of the patch over time (high turnover rate) (Cody 1985, Rosenzweig 1985, Askins et al. 1990, Primack 1998). Area-sensitive individuals attempting to breed in forest fragments begin to experience poor reproductive success and do not return in subsequent years (low site fidelity) (Donovan et al. 1995). Instability in the forest-interior breeding bird community and high turnover of breeding individuals is indicative of a population sink – a marginal habitat where reproductive success is low because of high nest depredation, brood parasitism, lack of adequate nest sites, poor prey availability, or a combination of these factors (Howe 1984, Wilcove 1985, Donovan et al. 1995, Burke and Nol 1998, Primack 1998, Boulinier et al. 2001).

Factors influencing effects of forest fragmentation and area sensitivity

There are many factors that influence the effects of forest fragmentation. When assessing the impacts of forest fragmentation from a landscape perspective, we need to look at the size and number of habitat patches left in the area, how far apart these patches are from each other (degree of isolation), how different the surrounding area (matrix) is from the habitat type, the type and duration of disturbance, and whether there is any type of connectivity or corridor between patches to facilitate animals moving from patch to patch (Wiens 1996, Marzluff and Ewing 2001).

A population that moves between and among patches of habitat via dispersal is called a metapopulation, or a "population of populations" (Forman 1995, Wiens 1996). It may include source populations, which have stable or positive population growth, and sink populations, which are unstable and dependent upon immigration of individu-

als from source populations for long-term persistence (Primack 1998). Generally, small, isolated forest patches tend to operate as sinks because they have a greater relative proportion of forest edge and little or no core area, which diminishes their ability to support viable populations of area-sensitive species. For birds, the result of habitat fragmentation is an increase in nest predators and brood parasitism, thus decreasing nesting success (Donovan et al. 1995). Large patches of contiguous forest usually act as sources, producing a surplus of individuals from high rates of reproductive success (Donovan et al. 1995). If a source habitat is fragmented, however, reproductive success drops, as does the tendency of the individuals to return to that habitat in subsequent years (Donovan et al. 1995). The results of this impact of fragmentation will not only affect the population in that source habitat, but it also will negatively affect populations in the surrounding sink habitats, as the surplus usually disperses to the neighboring sinks (Donovan et al. 1995).

Immigration and recolonization are critical for long-term, regional survival of local populations, particularly for endangered species. Imperiled species tend to have specific habitat requirements for foraging, nesting and cover (e.g., habitat "specialists"), making them more vulnerable to changes in the landscape. As it is, loss of habitat is the primary cause of the decline in species, affecting 85% of the species of plants, mammals, birds, reptiles, amphibians, fish, and invertebrates, followed by the increase of non-native species (Wilcove et al. 1998). When their habitats are lost or degraded because of fragmentation, individuals of the species also are lost because they cannot utilize habitats other than that which they are specialized for (With and Crist 1995, Collinge 1996). Furthermore, endangered species exist in much lower numbers, so it is critical that areas of suitable habitat are proximate, or connected, and the area of the habitat increased, if possible. This allows individuals to migrate to other sub populations, or into new areas of suitable habitat, while avoiding predators and hostile environments (e.g., roads, development) (Fahrig and Merriam 1985). Connectivity is particularly important for non vagile species (reptiles, amphibians, small mammals and some invertebrates) and large mammals with expansive home ranges, like bobcats (Collinge 1996, Wiens 1996).

Degree of isolation and patch connectivity. For Neotropical migrants, many factors influence how the degree of isolation of habitat patches affect metapopulations; e.g., how long the patches have been separated, how far apart the patches are from each other, how connected the patches are to each other, how different the surrounding matrix is from the habitat, how the species in question is able to disperse (Saunders et al. 1991, Collinge 1996, Bender et al. 1998, McCollin 1998) and the degree of breeding site fidelity. In general, larger forest patches that are closer together are better for the population and patches within 500 meters of each other are beneficial (Villard et al. 1999, Norris and Stutchbury 2001).

Isolated habitat patches, those that are not in close proximity or connected to patches of similar habitat, can present barriers to dispersal because of large distances to suitable habitats and/or impenetrable areas surrounding the patches of suitable habitat (Moilanen & Hanski 1998, Ricketts & Morris 2001,Vandermeer & Carvajal 2001). Isolated habitat patches tend to have a higher turnover rate for bird species than connected habitat patches (Schmiegelow et al. 1997), with fewer Neotropical migrant species occurring in more isolated forest patches (Faaborg et al. 1995).

Mammalian responses to fragmentation differs with body size, but overall, mammals are affected by habitat fragmentation and isolation (Crooks 2002). Bobcats have a home range of approximately 3 kilometers^2 (Crooks 2002) and can be found in habitat patches of 74 hectares, if in close proximity to other forest patches, but more likely in areas over 1,000 hectares. However, smaller carnivores, such as foxes, skunks, raccoons, opossums and domestic cats, have a home range size around 0.5 kilometers^2, and tend to occur in highly fragmented areas created by urban sprawl (Crooks 2002).

The effects of patch size and isolation on a population also depend largely on the amount of available habitat, the suitability of the surrounding matrix, how individuals move within and among patches (Forman and Godron 1981, Andren 1994, Wiens et al. 1997) and the degree of breeding-site fidelity of the species. Depending on the species, the effects of patch isolation may not occur until 10-50% of the original habitat remains. However, the critical

threshold of habitat loss where negative effects will become apparent is difficult to predict and varies for different species (With and Crist 1995). For interior-forest birds specifically, the number of species occurring in a forest patch is significantly reduced when 30-50% of the patch is removed (Franklin and Forman 1987). Habitat specialists are affected when less than 40% of the habitat remains, whereas habitat generalists, (those species that tend to persist in a highly fragmented landscape), can withstand a higher degree of habitat loss (With and Crist 1995). Northern spotted owls are area-sensitive habitat specialists, occurring only in large forest tracts of mature coniferous forest in the Pacific Northwest. Lamberson (1994) found that as the amount of habitat decreased, juvenile owls had more difficulty finding suitable habitat while dispersing, regardless of spacing of habitat patches. The breeding pairs exhibited high site fidelity and still produced young in the waning habitat. However, their offspring dispersed into the surrounding matrix, which was unsuitable habitat, and experienced high rates of mortality. The "point-of-no-return" for habitat loss with spotted owls was with less than 15% of suitable habitat remaining in the landscape. At this point there was virtually no probability of owls finding mates or suitable nesting sites, and the population of spotted owls in that landscape would soon be extirpated (Lamberson et al. 1994).

It is important to preserve and maintain large tracts of habitat for the most area-sensitive species. In landscapes where at least 30-40% of the habitat remains, spatial arrangement (proximity and connectivity) of habitat patches also can be very important (Franklin and Forman 1987, Andren 1994, With and Crist 1995, Forman and Collinge 1997, Fahrig 1998), as each species has its own threshold tolerance for habitat loss and fragmentation (Lovejoy and Oren 1981, Monkkonen and Reunanen 1999). There are, however, some species, such as the American marten, that are affected by habitat loss regardless of connectivity (Hargis 1999).

Ability to disperse. For birds and other animals that are very mobile, the effects of isolation on a population may only appear in very fragmented habitats (Andren 1994, With and Crist 1995). Birds are physically capable of dispersing over great distances and through various habitats during migration, which allows them to locate scarce patches of foraging and resting habitat. However, open areas within large patches of forest may act as a barrier to forest-interior species (Belisle and St. Clair 2001). Furthermore, larger distances between patches (>2.4 km) can hinder dispersal and re-colonization of patches during breeding (Bellamy et al. 1996).

Limited dispersal capabilities for non vagile animals (small mammals, reptiles, amphibians, invertebrates) make these species more sensitive to habitat fragmentation (Collinge 1996, Wiens 1996). The degree of isolation can be a more serious problem where the matrix may be a complete barrier to dispersal, cause direct mortality (roads and highways), or severely reduce the likelihood of survival during immigration through this matrix (Noss 1991). Barriers to immigration and emigration result in inbreeding depression from reduction in gene flow causing the isolated population to be more susceptible to disease, genetic abnormalities, and local extinction (Fahrig and Merriam 1985, Simberloff and Cox 1987, Beier 1993, Primack 1998). Roads act as barriers that isolate wetlands, which can cause a reduction in species richness of amphibians (Lehtinen et al. 1999). Roads also change the chemical conditions of wetlands and stream corridors from runoff of road salts, oil and other contaminants (Trombulak and Frissell 2000), which are also known to reduce amphibian populations (Lehtinen et al. 1999).

Existence of corridors. For habitat specialists or species with limited dispersal capabilities, the presence of corridors may provide an effective means to enhance dispersal, thus reducing the effects of isolation and fragmentation on a population (Simberloff and Cox 1987, Collinge 1996, Beier and Noss 1998, Haddad 1999). Habitat corridors are defined as "a linear landscape element that provides for movement between habitat patches" (Rosenberg and Noon 1997) and are predicted to be more beneficial to populations when connecting large patches of habitat (Haas 1995, Desrochers and Hannon 1997, Haddad 2000, Hudgens and Haddad 2003).

Larger mammals have been shown to include corridors in their home ranges (Simberloff and Cox 1987) and use them while dispersing (Beier 1995).

Furthermore, smaller-bodied species and species with high population growth rates that cannot survive outside the preferred habitat, such as some butterfly species, received greater benefits from habitat corridors than larger-bodied species (Fahrig and Merriam 1994, Bowne et al. 1998, Hudgens and Haddad 2003). Although the effectiveness of habitat corridors is disputed, particularly for birds (Simberloff and Cox 1987, Haddad 2000, Norris and Stutchbury 2001, Hudgens and Haddad 2003), studies have shown that corridors are more effective at greater widths (Collinge 1996, Haddad 1999, Haddad 2000). Many species of birds have a higher probability of using corridors as corridors get wider (Keller et al. 1993). Specifically, the probability of occurrence of prothonotary warblers, white-eyed vireos, eastern wood-pewees, red-eyed vireos, scarlet tanagers, kentucky warblers and louisiana waterthrushes all increased with corridor width. The probability of occurrence of acadian flycatchers and wood thrushes also increased with corridor width, but the maximum probability was at a width of only 300 meters for both species (Keller et al. 1993). From this kind of data, Hodges and Krementz (1996) and Keller et al. (1993) recommended that riparian corridors be a minimum of 100 meters wide to provide nesting habitat for area-sensitive species and Neotropical migrants, but priority should be made in preserving the widest corridors possible. Being that habitat corridors are intended to facilitate movement between habitat patches, we agree with Beier and Noss (1998) in their conclusion "that evidence from well-designed studies generally supports the utility of corridors as a conservation tool."

Disturbance. Disturbance is defined as an event that significantly alters the structure or function of a system (Forman 1995). There are generally two types of disturbance: Natural and human. For example, a natural disturbance may be caused by floods, earthquakes, fires, etc., while human disturbances exist as roads, agriculture, silviculture, etc. (Forman 1995).

For bird communities, the type of disturbance can have more of an effect than the extent of disturbance (Rodewald and Yahner 2001). Older forests with larger, fewer trees (large basal areas) and well-developed canopy, subcanopy, shrub, and herbaceous layers with a well-developed component of dead biomass (standing or fallen trees) support the highest diversity of species. Many silviculture practices favor monocultures and/or even-aged stands that are rarely left long enough to develop the necessary vegetative structure to support diverse faunal communities. Clear-cut forests tend to have the lowest species richness (Triquet et al. 1990). Higher numbers of species occur in uncut forests than in forests where best management practices with buffer strips are implemented.

Individual species have different levels of tolerance to different types of disturbance. For instance, blue-gray gnatcatchers, eastern towhees, ovenbirds, scarlet tanagers, and wood thrushes are intolerant to forest disturbance, while warbling vireos, yellow warblers, and field sparrows have a low tolerance to forest disturbance (Stauffer and Best 1980). Rodewald and Yahner (2001) found that agricultural disturbance within forested landscapes negatively affected bird communities in adjacent forests, and silvicultural practices, which produced even-aged forest stands, tended to increase the abundance of edge species and canopy nesters.

For species that require early-successional habitats (grassland and scrub-shrub bird communities), disturbance such as fire or mowing is necessary to maintain these habitats. Here again, vegetation structure is critical. Mechanized, row-crop agriculture does not produce suitable habitat for grassland species, and early mowing of non-row crops destroys nests, nestlings and adult birds. Conversion of farmland into development completely destroys habitat.

Roads have been used to define boundaries of habitat patches, particularly when bisecting a forest patch. Many small mammals and ground-dwelling invertebrates will perceive a roadway 20 meters wide or less as a barrier (Noss 1991). A road bisecting a forest would not affect the physical ability of birds to travel between patches (Hudgens and Haddad 2003), however, roads can impact species that prefer forest interiors and can cause high mortality of all species. Forman and Deblinger (2000) found the population of forest-interior species to be one-third its normal capacity within 650 meters of a four-lane highway. The noise generated from traffic along a major highway caused birds to avoid areas from 40 to 2,800 meters of the

road, depending on the amount of traffic (Reijnan et al. 1995).

As with forest-interior species, recent research has demonstrated that the presence of vehicular traffic can cause otherwise suitable early-successional habitat to become unsuitable. The presence of grassland birds breeding in an area of quality habitat (hayfield, lightly grazed pasture, old field) is affected by the size of the patch and the distance of the patch to a road with moderate or heavy traffic (>8,000 vehicles per day) (Reijnan et al. 1995, Forman et al. 2002). Fewer breeding birds were found in patches of quality grassland habitat within 400 meters of a road with moderate traffic (8,000-15,000 vehicles per day) to 1,200 meters of a road with heavy traffic (= 30,000 vehicles per day) (Reijnan et al. 1995, Forman et al. 2002). eastern meadowlarks, in particular, are less sensitive than other grassland species to traffic volume, being affected by roads with only heavy traffic (= 30,000 vehicles per day), but are more sensitive to the amount of development surrounding the habitat patch (Forman et al. 2002).

Table I. Priority Bird Species Based on Habitat Preference.

Common Name	*Migratory Habit*	*Area Sensitive*	*Vulnerable to Fragmentation*	*Citation ID*
Interior Forest				
Acadian Flycatcher	Neotropical	Yes	Yes	1
Baltimore Oriole	Neotropical	No	No	43
Black-and-white Warbler	Neotropical	Yes	Yes	8
Black-billed Cuckoo	Neotropical	Yes	Yes	6
Blackburnian Warbler	Neotropical	Yes	Yes	14
Black-throated Blue Warbler	Neotropical	Yes	Yes	15
Black-throated Green Warbler	Neotropical	Yes	Yes	5
Broad-winged Hawk	Neotropical	Yes	Yes	10
Canada Warbler	Neotropical	Yes	Yes	11
Carolina Chickadee	Resident	Yes	Yes	44
Cerulean Warbler	Neotropical	Yes	Yes	45
Eastern Wood-pewee	Neotropical	Yes	Yes	9
Gray Catbird	Short distance	Moderate	Moderate	44
Hairy Woodpecker	Resident	Yes	Yes	44
Hermit Thrush	Short distance	Unknown	Unknown	36
Hooded Warbler	Neotropical	Yes	Yes	7
Kentucky Warbler	Neotropical	Yes	Yes	28
Least Flycatcher	Neotropical	Yes	No	18
Louisiana Waterthrush	Neotropical	Yes	Yes	8
Northern Flicker	Resident	No	Moderate	37
Northern Parula	Neotropical	Yes	Yes	25
Northern Saw-whet Owl	Short distance	Yes	No	21
Pine Warbler	Neotropical	Yes	Yes	27
Prothonotary Warbler	Neotropical	Yes	Yes	46
Purple Finch	Short distance	No	Yes	48
Red Crossbill	Short distance	Unknown	Unknown	
Red-breasted Nuthatch	Short distance	Unknown	Unknown	36
Red-eyed Vireo	Neotropical	Yes	Yes	44
Rose-breasted Grosbeak	Neotropical	No	No	49
Scarlet Tanager	Neotropical	Yes	Yes	44
Sharp-shinned Hawk	Short distance	Yes	Unknown	16
Blue-headed Vireo	Neotropical	Yes	Yes	5
Veery	Neotropical	Yes	Yes	12
White-eyed Vireo	Short distance	Yes	Yes	40
Winter Wren	Short distance	Yes	Yes	5
Wood Thrush	Neotropical	Yes	Yes	26
Worm-eating Warbler	Neotropical	Yes	Yes	8
Yellow-billed Cuckoo	Neotropical	Yes	Yes	20
Yellow-throated Vireo	Neotropical	Yes	Yes	4

Table I. (Cont.) Priority Bird Species Based on Habitat Preference.

Common Name	*Migratory Habit*	*Area Sensitive*	*Vulnerable to Fragmentation*	*Citation ID*
Grassland				
American Kestrel	Short distance	Yes	No	31
Barn Owl	Short distance	No	No	35
Dickcissel	Neotropical	Yes	No	29
Eastern Bluebird	Short distance	No	No	3
Eastern Kingbird	Neotropical	No	No	38
Eastern Meadowlark	Short distance	Yes	No	34
Northern Bobwhite	Resident	Moderate	No	17
Horned Lark	Short distance	No	No	13
Shrub-Scrub/Barrens				
American Woodcock	Short distance	No	No	33
Blue-winged Warbler	Neotropical	Unknown	No	19
Brown Thrasher	Short distance	Unknown	Unknown	
Chuck-will's Widow	Neotropical	Yes	No	47
Common Nighthawk	Neotropical	No	No	42
Eastern Towhee	Short distance	Moderate	No	32
Field Sparrow	Short distance	Moderate	Moderate	22
Golden-winged Warbler	Neotropical	Unknown	No	24
Indigo Bunting	Neotropical	No	Moderate	41
Prairie Warbler	Neotropical	Yes	Yes	2
Whip-poor-will	Neotropical	Unknown	Moderate	23
Willow Flycatcher	Neotropical	Unknown	Yes	39
Yellow-breasted Chat	Neotropical	No	No	30

Table II. Literature Citations for Species in Table I.

ID	Citation
1	Askins & Philbrick 1987, Benzinger 1994, Darr et al. 1998, Rich et al. 1994, Robbins et al. 1989, Whitcomb et al. 1981
2	A. Dey unpubl. Data, McIntyre 1995, Staicer et al. 1995
3	Adair & Plissner 1998
4	Askins & Philbrick 1987, Rich et al. 1994, Zeller et al. 1993
5	Askins & Philbrick 1987, Benzinger 1994, Rich et al. 1994
6	Askins & Philbrick 1987, Darr et al. 1998, Deeble et al. 2000, Rich et al 1994, Whitcomb et al. 1981
7	Askins & Philbrick 1987, Darr et al. 1998, Heckscher & Mehlman 1999, Rich et al. 1994, Whitcomb et al. 1981
8	Askins & Philbrick 1987, Darr et al. 1998, Rich et al. 1994, Robbins et al. 1989, Whitcomb et al. 1981
9	Askins & Philbrick 1987, Darr et al. 1998, Rich et al. 1994, Whitcomb et al. 1981
10	Askins & Philbrick 1987, Rich et al. 1994
11	Askins & Philbrick 1987, Rich et al. 1994, Robbins et al. 1989
12	Askins & Philbrick 1987, Rich et al. 1994, Robbins et al. 1989, Whitcomb et al. 1981
13	Beasen 1995, Dinkins et al. 2001
14	Benzinger 1994, Catlin et al. 1999
15	Benzinger 1994, Robbins et al. 1989
16	Bildstein & Meyer 2000
17	Brennan 1999
18	Briskie 1994, Villard et al 1999
19	Brown et al. 1999
20	Brown et al. 1999, Darr et al. 1998, Robbins et al. 1989, Whitcomb et al. 1981
21	Cannings 1993
22	Carey et al. 1993, Dechant et al. 2001
23	Cink 2002
24	Confer et al. 1992
25	Darr et al. 1998, Hammerson et al. 2001, Robbins et al 1989, Whitcomb et al. 1981
26	Darr et al. 1998, Hoover et al. 1995, Robbins et al. 1989, Whitcomb et al. 1981
27	Darr et al. 1998, Rodewald et al. 1995, Whitcomb et al. 1981
28	Darr et al. 1998, Robbins et al. 1989, Whitcomb et al. 1981
29	Dechant et al. 2001
30	Eckerle & Thompson 2001, Thompson et al. 1996
31	Forman et al. 1976
32	Greenlaw 1996
33	Keppie & Whiting 1994
34	Lanyon 1995, Forman et al. 2002
35	Marti 1992, Rosenburg et al. 1998
36	McIntyre 1995
37	Moore 1995
38	Murphy 1996
39	Paige et al. 1998
40	Palis et al. 2001
41	Payne 1992
42	Poulin et al. 1996
43	Rising & Flood 1998
44	Robbins et al. 1989
45	Robbins et al. 1989, Whitcomb et al. 1981
46	Sallabanks et al. 1993, Whitcomb et al. 1981
47	Straight & Cooper 2000
48	Wootton 1996
49	Wyatt & Francis 2002

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Andren, H. 1994. Effects of habitat fragmentation on birds and mammals in landscapes with different proportions of suitable habitat: a review. Oikos 71(3):355-362.

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Appendix II. Additional Methods for Extracting Critical Wildlife Areas from Urban Land-use/Land-cover Classes

LU/LC class 1400

1400 TRANSPORTATION, COMMUNICATION & UTILITIES

The transportation, communication, and utilities land uses are often associated with the other Urban or Built-up categories, but are often found in other categories. However, they often do not meet the minimum size required for mapping and are considered an integral part of the land use in which they occur. The presence of major transportation routes, utilities such as sewage treatment plants and power lines, and communications facilities greatly influence both the present and potential uses of an area. These areas generally have a high percentage of impervious surface coverage.

- Select the polygons from the "1400 TRANSPORTATION / COMMUNICATIONS / UTILITIES," as coded in the NJDEP Land Use/Land Cover, that have less than or equal to 5% impervious surface.
- From this subset intersect the grassland species models. Where there is overlap, recode these polygons as "Grassland." All other polygons from the subset will be recoded as "Forest."
- Merge the recoded polygons into the existing "Grassland" and "Forest" layers respectively.
- Dissolve the resultant "Grassland" and "Forest" layers.
- Assign a unique Link ID to each of the independent "Grassland" and "Forest" polygons (patches).

LU/LC class 1700

1700 OTHER URBAN OR BUILT-UP

Included are undeveloped, open lands within urban areas. Some structures may be visible, as in the case of abandoned residential or commercial sites that have not yet been redeveloped. Other areas may be brush-covered or grassy. Large, managed, maintained lawns common to some residential areas, and those open areas of commercial/service complexes, educational installations, etc., are also included. Undeveloped, but maintained lawns in urban parks are also part of this category, if a specific recreational use is not evident. In addition, areas that have been partially developed or redeveloped but remain unfinished are included. Also included in this category are cemeteries.

- Select the polygons from the "1700 OTHER URBAN OR BUILT UP LANDS," as coded in the NJDEP Land Use/Land Cover, that have less than or equal to10% impervious surface.
- From this subset, select the polygons within 0.8 kilometers of an airport, using an airport shapefile from the 2002 National Transportation Atlas.
- Create a new grassland/airport shapefile using the selected polygons.
- From grassland/airport shapefile, recode all of the polygons in the lower 10 kilometers of Cape May as "Grassland."
- For all areas outside of the lower 10 kilometers, select the polygons that meet the minimum size requirement for grasslands (18 hectares). Add to that selected set, the polygons that intersect a grassland species model.
- Recode the selected polygons as "Grassland."
- Merge all of the recoded polygons into the existing "Grassland" layer.
- Dissolve the resultant "Grassland" layer.
- Assign a unique Link ID to each of the independent "Grassland" polygons (patches).

Appendix III. Protocol for Accepting or Rejecting Species Sighting Reports

1. When a sighting report arrives at the ENSP office it is logged in and tracked in a database, regardless of acceptability.
2. If no additional information is needed, the sighting report is sent to the appropriate ENSP biologist for review.
3. If additional information is needed, an attempt is made to obtain the required information. This can include sending a map to the observer to mark the location of the sighting, a telephone interview to clarify information, etc. After all of the required information is obtained the report is sent to the appropriate ENSP biologist for review.
4. ENSP biologist receives the sighting report and reviews it for acceptability/reliability. A species sighting is accepted or rejected based on the following criteria:

- Did the sighting occur within the known range of the species?
- Did the sighting occur in the known/recognized habitat for the species?
- Is the species easily identified, or is it often confused with another?
- Did anyone else confirm the sighting, or can someone else vouch for the observer's identification skills?
- Do we have first-hand knowledge of the observer's identification skills?
- Did the observer include a photograph?
- Is the species listed as endangered or threatened for the season in which it was reported? (Some species can have a separate status for breeding season and non breeding season.)
- If uncertainty remains about the validity of the sighting, the observer is interviewed by the ENSP biologist.

    a. If sufficient information accompanies the sighting report the record is either accepted or rejected by an ENSP biologist. The report is then returned to ENSP's GIS staff and advances to step 5 if accepted.
    b. The reviewing biologist may determine that it is necessary to gather additional information (e.g., ascertain observer experience, ask if there have been additional sightings, ask for photos, ask for verifications by second observer, etc.) before the record can be accepted. If the record is accepted, advance to step 5.
    c. If the reviewing biologist determines that the sighting must be field checked, it is initially rejected until fieldwork can be scheduled to verify the sighting.

5. ENSP GIS staff digitizes the sighting location and prepares the data in a standardized format to submit to the Natural Heritage Program (NHP).
6. NHP quality checks the documents submitted and enters the data into the Biological Conservation Database (BCD).

Appendix IV. Species Models

Common Name	*Landscape Model*
Birds	
Federal T or E	
BALD EAGLE FORAGING AREA*	Foraging Model
BALD EAGLE NEST BUFFER	1 km buffer
BALD EAGLE WINTERING SITE	Not used
PIPING PLOVER	Digitized by ENSP staff
ROSEATE TERN	BCD model
State Endangered	
AMERICAN BITTERN	BCD model
BLACK SKIMMER	BCD model/digitized by ENSP Staff
BLACK SKIMMER FORAGING AREA[1]	Based on ENSP digitized polygons
HENSLOW'S SPARROW	BCD model
LEAST TERN[1]	BCD model/digitized by ENSP Staff
LEAST TERN FORAGING HABITAT[1]	Based on ENSP digitized polygons
MIGRANT LOGGERHEAD SHRIKE	BCD model
MIGRATORY RAPTOR CONCENTRATION SITE[2]	BCD model
MIGRATORY SHOREBIRD CONCENTRATION SITE[3]	BCD model
NORTHERN GOSHAWK	BCD model, 300 m buffer
NORTHERN HARRIER	BCD model
PEREGRINE FALCON*	1 km buffer
PIED-BILLED GREBE	BCD model
RED-SHOULDERED HAWK[4]	BCD model/1.609 km buffer
SEDGE WREN	BCD model
SHORT-EARED OWL	BCD model
UPLAND SANDPIPER	BCD model
VESPER SPARROW	BCD model
State Threatened	
BARRED OWL[4]	BCD model/1.609 km buffer
BLACK RAIL	BCD model
BLACK-CROWNED NIGHT-HERON	BCD model/digitized by ENSP Staff
BLACK-CROWNED NIGHT-HERON FORAGING HABITAT[1]	Based on ENSP digitized polygons
BLACK-CROWNED NIGHT-HERON NESTING HABITAT[1]	Based on ENSP digitized polygons
BOBOLINK	BCD model
COOPER'S HAWK	BCD model, 300 m buffer
GRASSHOPPER SPARROW	BCD model
LONG-EARED OWL	BCD model
OSPREY	BCD model, 300 m buffer
RED KNOT	BCD model
RED-HEADED WOODPECKER	BCD model
SAVANNAH SPARROW	BCD model
YELLOW-CROWNED NIGHT-HERON	BCD model/digitized by ENSP Staff
YELLOW-CROWNED NIGHT-HERON FORAGING HABITAT[1]	Based on ENSP digitized polygons
YELLOW-CROWNED NIGHT-HERON NESTING HABITAT[1]	Based on ENSP digitized polygons

Appendix IV. (Cont.)

Common Name	*Landscape Model*
Priority Species	
BIRD SPECIES OF PRIORITY	BCD model
COLONIAL WATERBIRD FORAGING HABITAT[1]	Based on ENSP digitized polygons
COLONIAL WATERBIRD NESTING HABITAT[1]	Based on ENSP digitized polygons
Herptiles	
Federal T or E	
ATLANTIC GREEN TURTLE	Not used
ATLANTIC HAWKSBILL	Not used
ATLANTIC LEATHERBACK	Not used
ATLANTIC LOGGERHEAD	Not used
ATLANTIC RIDLEY	Not used
BOG TURTLE[5]	DEP FWW selected that represent habitat
State Endangered	
BLUE-SPOTTED SALAMANDER	300 m buffer
COPE'S GRAY TREEFROG	300 m buffer
CORN SNAKE	BCD model
EASTERN TIGER SALAMANDER	300 m buffer
TIMBER RATTLESNAKE[6]	BCD/southern forested wetland model
State Threatened	
EASTERN MUD SALAMANDER	BCD model
LONGTAIL SALAMANDER	300 m buffer
NORTHERN PINE SNAKE	500 m buffer
PINE BARRENS TREEFROG	300 m buffer
WOOD TURTLE*	Wood turtle model
Priority Species	
HERPTILE SPECIES OF PRIORITY	1/6 USGS Quadrangle
Invertebrates	
Federal T or E	
AMERICAN BURYING BEETLE	BCD model
DWARF WEDGEMUSSEL	Not used
MITCHELL'S SATYR	BCD model
NORTHEASTERN BEACH TIGER BEETLE	BCD model
State Endangered	
APPALACHIAN GRIZZLED SKIPPER	BCD model
AROGOS SKIPPER	BCD model
BRONZE COPPER	BCD model
BROOK FLOATER	Not used
GREEN FLOATER	Not used
State Threatened	
CHECKERED WHITE	BCD model
EASTERN LAMPMUSSEL	Not used
EASTERN PONDMUSSEL	Not used

Appendix IV. (Cont.)

Common Name	*Landscape Model*
State Threatened	
FROSTED ELFIN	BCD model
SILVER-BORDERED FRITILLARY	BCD model
TIDEWATER MUCKET	BCD model
TRIANGLE FLOATER	Not used
YELLOW LAMPMUSSEL	Not used
Priority Species	
INVERTEBRATE SPECIES OF PRIORITY	BCD model
Mammals	
Federal T or E	
BLACK RIGHT WHALE	Not used
BLUE WHALE	Not used
FIN WHALE	Not used
HUMPBACK WHALE	Not used
INDIANA BAT	2 km buffer
SEI WHALE	Not used
SPERM WHALE	Not used
State Endangered	
ALLEGHENY WOODRAT	BCD model
BOBCAT[4]	BCD model

**For explanation of model see "Detailed Methodology for Delineating Critical Areas by Special Habitat Requirements."*

1. Colonial Nesting Waterbirds

Terns and Skimmers: Nesting area critical habitat includes all open water, beaches, mudflats and emergent wetlands within the foraging radius from a known nesting colony.

Foraging radii:

black skimmer	10.46 kilometers	forsters tern	12.07 kilometers
least tern	4.82 kilometers	common tern	12.07 kilometers

Herons and Egrets: Critical nesting habitat includes all undeveloped habitat within 90 meters (3 pixels) of a known nesting colony, 180 meters for great blue heron. Critical foraging habitat includes all emergent wetlands, all tidal creeks and ditches, and all open waters within 90 meters of the shoreline within the foraging radius of a known nesting colony.

Foraging radii:

great egret	11.42 kilometers	tricolored heron	10.46 kilometers
snowy egret	13.84 kilometers	black-crowned night heron	9.65 kilometers
cattle egret	11.26 kilometers	yellow-crowned night heron	2.73 kilometers
great blue heron	12.07 kilometers	glossy ibis	14.64 kilometers
little blue hereon	13.19 kilometers		

2. Migratory Raptor Concentration Site: All non developed habitat (1995 CRSSA LC) in the lower 10 kilometers of the Cape May peninsula.

3. **Migratory Shorebird Concentration Site:** ENSP staff hand-digitized polygons that represent sites where migratory shorebirds congregate for feeding or staging during migration.

4. **Barred Owl, Red-shouldered Hawk and Bobcat:** Since these species require large, unfragmented patches of forest they only value those patches that meet the core area requirements as defined in the "Detailed Methodology for Delineating Critical Areas by Habitat Type" section of this document.

5. **Bog Turtle:** Critical areas for bog turtles are mapped by hand-selecting emergent, scrub/shrub, modified agricultural and forested wetland polygons from the DEP Freshwater Wetlands maps. The selected wetland habitats correspond to core bog turtle habitat (i.e. where turtles are concentrated), contiguous dispersal corridors between extant colonies within 1.6 kilometers of each other, and groundwater discharge areas, where possible. Only extant populations were mapped. Suitable bog turtle habitat that is not connected to an extant site is not incorporated into the mapping.

6. **Timber Rattlesnake**

   Skylands Landscape: Hand-digitized polygons that represent timber rattlesnake den locations and their associated foraging areas. This is adequate in protecting the majority of female gestating and birthing areas, transient habitat and foraging habitat. Most gestating and birthing areas in this part of the state occur within a few to several hundred meters of the den location.

   Pinelands and Delaware Bay Landscapes: Any portion of a stream (including intermittent) within 2.5 kilometers of a timber rattlesnake occurrence (seconds precision only) is considered "potential hibernacula." The identified stream segments are buffered 1 kilometer.

Appendix V. NJDEP 1995/97 Land-use/Land-cover Classes and Corresponding Landscape Habitats

Level 1 Class	*Level 3 Modified Class*	*Habitat*
BARREN LAND	BEACHES	Beach
WETLANDS	AGRICULTURAL WETLANDS (MODIFIED)	Emergent Wetland
WETLANDS	FORMER AGRICULTURAL WETLAND (BECOMING SHRUBBY)	Emergent Wetland
WETLANDS	FRESHWATER TIDAL MARSHES	Emergent Wetland
WETLANDS	HERBACEOUS WETLANDS	Emergent Wetland
WETLANDS	SALINE MARSHES	Emergent Wetland
WETLANDS	SEVERE BURNED WETLANDS	Emergent Wetland
WETLANDS	VEGETATED DUNE COMMUNITIES	Emergent Wetland
WETLANDS	WETLAND RIGHTS-OF-WAY (MODIFIED)	Emergent Wetland
FOREST	CONIFEROUS BRUSH/SHRUBLAND	Forest
FOREST	CONIFEROUS FOREST (>50% CROWN CLOSURE)	Forest
FOREST	CONIFEROUS FOREST (10-50% CROWN CLOSURE)	Forest
FOREST	DECIDUOUS BRUSH/SHRUBLAND	Forest
FOREST	DECIDUOUS FOREST (>50% CROWN CLOSURE)	Forest
FOREST	DECIDUOUS FOREST (10-50% CROWN CLOSURE)	Forest
FOREST	MIXED DECIDUOUS/CONIFEROUS BRUSH/SHRUBLAND	Forest
FOREST	MIXED FOREST (>50% CONIFEROUS WITH >50% CROWN CLOSURE)	Forest
FOREST	MIXED FOREST (>50% CONIFEROUS WITH 10%-50% CROWN CLOSURE)	Forest
FOREST	MIXED FOREST (>50% DECIDUOUS WITH >50% CROWN CLOSURE)	Forest
FOREST	MIXED FOREST (>50% DECIDUOUS WITH 10-50% CROWN CLOSURE)	Forest
FOREST	OLD FIELD (< 25% BRUSH COVERED)	Forest
FOREST	PLANTATION	Forest
FOREST	SEVERE BURNED UPLAND VEGETATION	Forest
AGRICULTURE	CONFINED FEEDING OPERATIONS	Grassland
AGRICULTURE	CROPLAND AND PASTURELAND	Grassland
AGRICULTURE	ORCHARDS/VINEYARDS/NURSERIES/ HORTICULTURAL AREAS	Grassland
AGRICULTURE	OTHER AGRICULTURE	Grassland
URBAN*	OTHER URBAN OR BUILT-UP LAND	Grassland
URBAN*	TRANSPORTATION/COMMUNICATIONS/UTILITIES	Grassland/Forest
WETLANDS	ATLANTIC WHITE CEDAR SWAMP	Forested Wetland/Forest
WETLANDS	CONIFEROUS SCRUB/SHRUB WETLANDS	Forested Wetland/Forest
WETLANDS	CONIFEROUS WOODED WETLANDS	Forested Wetland/Forest
WETLANDS	DECIDUOUS SCRUB/SHRUB WETLANDS	Forested Wetland/Forest
WETLANDS	DECIDUOUS WOODED WETLANDS	Forested Wetland/Forest
WETLANDS	MIXED FORESTED WETLANDS (CONIFEROUS DOM.)	Forested Wetland/Forest
WETLANDS	MIXED FORESTED WETLANDS (DECIDUOUS DOM.)	Forested Wetland/Forest
WETLANDS	MIXED SCRUB/SHRUB WETLANDS (CONIFEROUS DOM.)	Forested Wetland/Forest
WETLANDS	MIXED SCRUB/SHRUB WETLANDS (DECIDUOUS DOM.)	Forested Wetland/Forest

A method using impervious service and species models was developed to select out rights-of-way that contained critical areas from this classification (Appendix II**).*

Appendix VI. Species and the Habitat Types they Value

Common Name	*Emergent Wetland*	*Forested Wetland*	*Forest*	*Grassland*	*Beach*
Birds					
Federal T or E					
BALD EAGLE FORAGING AREA					
BALD EAGLE NEST BUFFER	X	X	X	X	
PIPING PLOVER					X
ROSEATE TERN	X				X
State Endangered					
AMERICAN BITTERN	X				
BLACK SKIMMER	X				X
BLACK SKIMMER FORAGING AREA	X				
HENSLOW'S SPARROW	X			X	
LEAST TERN	X				X
LEAST TERN FORAGING HABITAT	X				
MIGRANT LOGGERHEAD SHRIKE				X	
MIGRATORY RAPTOR CONCENTRATION SITE	X	X	X	X	
MIGRATORY SHOREBIRD CONCENTRATION SITE					X
NORTHERN GOSHAWK		X	X		
NORTHERN HARRIER	X			X	
PEREGRINE FALCON	X				
PIED-BILLED GREBE	X				
RED-SHOULDERED HAWK		X	X*		
SEDGE WREN	X			X	
SHORT-EARED OWL	X			X	
UPLAND SANDPIPER				X	
VESPER SPARROW				X	
State Threatened					
BARRED OWL		X	X*		
BLACK RAIL	X				
BLACK-CROWNED NIGHT-HERON	X				
BLACK-CROWNED NIGHT-HERON FORAGING HABITAT	X				
BLACK-CROWNED NIGHT-HERON NESTING HABITAT	X		X		
BOBOLINK				X	
COOPER'S HAWK		X	X		
GRASSHOPPER SPARROW				X	
LONG-EARED OWL			X	X	
OSPREY	X				X
RED KNOT	X				X
RED-HEADED WOODPECKER			X		
SAVANNAH SPARROW				X	
YELLOW-CROWNED NIGHT-HERON	X				
YELLOW-CROWNED NIGHT-HERON FORAGING HABITAT	X				

Appendix VI. (Cont.)

Common Name	*Emergent Wetland*	*Forested Wetland*	*Forest*	*Grassland*	*Beach*
State Threatened					
YELLOW-CROWNED NIGHT-HERON NESTING HABITAT	X		X		
Priority Species					
ACADIAN FLYCATCHER		X	X		
AMERICAN BLACK DUCK	X	X			
AMERICAN KESTREL				X	
AMERICAN OYSTERCATCHER	X				X
AMERICAN WOODCOCK		X	X		
ARCTIC TERN	X				X
BALTIMORE ORIOLE			X		
BARN OWL				X	
BLACK TERN					X
BLACK-AND-WHITE WARBLER		X	X		
BLACK-BILLED CUCKOO		X	X		
BLACKBURNIAN WARBLER		X	X		
BLACK-THROATED BLUE WARBLER		X	X		
BLACK-THROATED GREEN WARBLER		X	X		
BLUE-WINGED WARBLER	X	X	X		
BROAD-WINGED HAWK			X		
BROWN CREEPER		X	X		
BROWN THRASHER		X	X		
CANADA WARBLER		X	X		
CAROLINA CHICKADEE		X	X		
CASPIAN TERN	X				X
CATTLE EGRET	X				
CERULEAN WARBLER		X	X		
CHIMNEY SWIFT					
CHUCK-WILL'S-WIDOW		X	X		
CLAPPER RAIL	X				
CLIFF SWALLOW	X			X	
COLONIAL WATERBIRD FORAGING HABITAT	X				
COLONIAL WATERBIRD NESTING HABITAT	X		X		
COMMON MOORHEN	X				
COMMON NIGHTHAWK			X	X	X
COMMON TERN	X				X
DICKCISSEL				X	
EASTERN BLUEBIRD				X	
EASTERN KINGBIRD				X	
EASTERN MEADOWLARK				X	
EASTERN TOWHEE		X	X		
EASTERN WOOD-PEWEE			X		
FIELD SPARROW				X	
FORSTER'S TERN	X				X
GLOSSY IBIS	X				
GOLDEN-WINGED WARBLER			X		
GRAY CATBIRD		X	X		
GRAY-CHEEKED THRUSH		X	X		

Appendix VI. (Cont.)

Common Name	*Emergent Wetland*	*Forested Wetland*	*Forest*	*Grassland*	*Beach*
Priority Species					
GREAT BLUE HERON	X	X	X		
GREAT EGRET	X				
GULL-BILLED TERN	X				X
HAIRY WOODPECKER		X	X		
HERMIT THRUSH		X	X		
HOODED WARBLER		X	X		
HORNED LARK				X	X
IPSWICH SPARROW				X	X
KENTUCKY WARBLER		X	X		
KING RAIL	X				
LEAST BITTERN	X				
LEAST FLYCATCHER		X	X		
LITTLE BLUE HERON	X				
LOUISIANA WATERTHRUSH		X	X		
MARSH WREN	X				
NORTHERN BOBWHITE				X	
NORTHERN PARULA		X	X		
NORTHERN SAW-WHET OWL			X		
PINE WARBLER		X	X		
PRAIRIE WARBLER		X	X		
PROTHONOTARY WARBLER		X	X		
PURPLE FINCH		X	X		
RED CROSSBILL		X	X		
RED-BREASTED NUTHATCH		X	X		
RED-EYED VIREO		X	X		
ROSE-BREASTED GROSBEAK		X	X		
SALTMARSH SHARP-TAILED SPARROW	X				
SANDERLING					X
SCARLET TANAGER		X	X		
SEASIDE SPARROW	X				
SHARP-SHINNED HAWK		X	X		
SNOWY EGRET	X				
SOLITARY VIREO (BLUE-HEADED VIREO)		X	X		
SPOTTED SANDPIPER	X				
TERN SPECIES FORAGING HABITAT	X				
TRICOLORED HERON	X				
VEERY		X	X		
VIRGINIA RAIL	X				
WHIMBREL	X				
WHIP-POOR-WILL		X	X		
WHITE-EYED VIREO		X	X		
WILLET	X				X
WILLOW FLYCATCHER		X	X		
WINTER WREN		X	X		
WOOD THRUSH		X	X		
WORM-EATING WARBLER		X	X		
YELLOW-BILLED CUCKOO		X	X		
YELLOW-BREASTED CHAT		X	X		
YELLOW-THROATED VIREO		X	X		

Appendix VI. (Cont.)

Common Name	*Emergent Wetland*	*Forested Wetland*	*Forest*	*Grassland*	*Beach*
Herptiles					
Federal T or E					
BOG TURTLE	X	X			
State Endangered					
BLUE-SPOTTED SALAMANDER	X	X	X		
COPE'S GRAY TREEFROG	X	X	X		
CORN SNAKE			X		
EASTERN TIGER SALAMANDER	X	X	X		
TIMBER RATTLESNAKE		X	X		
State Threatened					
EASTERN MUD SALAMANDER		X	X		
LONGTAIL SALAMANDER	X	X	X		
NORTHERN PINE SNAKE			X	X	
PINE BARRENS TREEFROG	X	X	X		
WOOD TURTLE					
Priority Species					
CARPENTER FROG	X	X			
COASTAL PLAIN MILK SNAKE			X	X	
EASTERN BOX TURTLE			X	X	
EASTERN KINGSNAKE		X	X		
FOWLER'S TOAD	X	X			
JEFFERSON SALAMANDER		X	X		
MARBLED SALAMANDER	X	X	X		
NORTHERN COPPERHEAD			X		
NORTHERN DIAMONDBACK TERRAPIN	X				
NORTHERN SPRING SALAMANDER		X	X		
SPOTTED TURTLE	X	X			
Invertebrates					
Federal Tor E					
AMERICAN BURYING BEETLE					X
MITCHELL'S SATYR	X	X	X	X	
NORTHEASTERN BEACH TIGER BEETLE					X
State Endangered					
APPALACHIAN GRIZZLED SKIPPER	X	X	X	X	
AROGOS SKIPPER	X	X	X	X	
BRONZE COPPER	X	X	X	X	
State Threatened					
SILVER-BORDERED FRITILLARY	X	X	X	X	
CHECKERED WHITE	X	X	X	X	
FROSTED ELFIN	X	X	X	X	

Appendix VI. (Cont.)

Common Name	*Emergent Wetland*	*Forested Wetland*	*Forest*	*Grassland*	*Beach*
Priority Species					
DOTTED SKIPPER	X	X	X	X	
GEORGIA SATYR	X	X	X	X	
HARISS CHECKERSPOT	X	X	X	X	
HESSEL'S HAIRSTREAK	X	X	X	X	
HOARY ELFIN	X	X	X	X	
NORTHERN METALMARK	X	X	X	X	
TWO-SPOTTED SKIPPER	X	X	X	X	
Mammals					
Federal T or E					
INDIANA BAT		X	X		
State Endangered					
ALLEGHENY WOODRAT			X		
BOBCAT	X	X	X*		

**Only values forest patches that meet the minimum core requirements.*

Appendix VII. Species and the Landscape Regions in which they Occur*

Common Name	*Delaware Bay*	*Coastal*	*Piedmont Plains*	*Pinelands*	*Skylands*
Birds					
Federal T or E					
BALD EAGLE FORAGING AREA	X	X	X	X	X
BALD EAGLE NEST BUFFER	X	X	X	X	X
PIPING PLOVER	X	X	X		
ROSEATE TERN		X			
State Endangered					
AMERICAN BITTERN			X	X	X
BLACK SKIMMER		X			
BLACK SKIMMER FORAGING AREA	X	X		X	
HENSLOW'S SPARROW	X	X	X		X
LEAST TERN	X	X	X	X	
LEAST TERN FORAGING HABITAT	X	X		X	
MIGRANT LOGGERHEAD SHRIKE	X	X	X		X
MIGRATORY RAPTOR CONCENTRATION SITE	X	X			
MIGRATORY SHOREBIRD CONCENTRATION SITE	X	X	X		
NORTHERN GOSHAWK				X	X
NORTHERN HARRIER	X	X	X	X	X
PEREGRINE FALCON	X	X	X	X	
PIED-BILLED GREBE	X	X	X	X	X
RED-SHOULDERED HAWK	X		X	X	X
SEDGE WREN	X		X		X
SHORT-EARED OWL	X	X			
UPLAND SANDPIPER			X	X	X
VESPER SPARROW	X		X	X	X
State Threatened					
BARRED OWL	X	X	X	X	X
BLACK RAIL	X	X			X
BLACK-CROWNED NIGHT-HERON	X	X	X	X	X
BLACK-CROWNED NIGHT-HERON FORAGING HABITAT	X	X	X	X	
BLACK-CROWNED NIGHT-HERON NESTING HABITAT		X	X		X
BOBOLINK	X		X	X	X
COOPER'S HAWK	X	X	X	X	X
GRASSHOPPER SPARROW	X		X	X	X
LONG-EARED OWL	X		X		X
OSPREY	X	X	X	X	X
RED KNOT	X	X			
RED-HEADED WOODPECKER	X		X	X	X
SAVANNAH SPARROW	X		X	X	X
YELLOW-CROWNED NIGHT-HERON		X	X	X	
YELLOW-CROWNED NIGHT-HERON FORAGING HABITAT	X	X	X	X	
YELLOW-CROWNED NIGHT-HERON NESTING HABITAT		X	X		

**Based on known species' ranges within the state.*

Appendix VII. (Cont.)

Common Name	*Delaware Bay*	*Coastal*	*Piedmont Plains*	*Pinelands*	*Skylands*
Priority Species					
ACADIAN FLYCATCHER	X		X	X	X
AMERICAN BLACK DUCK	X	X	X	X	X
AMERICAN KESTREL	X		X		X
AMERICAN OYSTERCATCHER	X	X			
AMERICAN WOODCOCK	X	X	X	X	X
ARCTIC TERN		X			
BALTIMORE ORIOLE	X		X	X	X
BARN OWL	X	X	X		
BLACK TERN		X			
BLACK-AND-WHITE WARBLER	X		X	X	X
BLACK-BILLED CUCKOO	X		X	X	X
BLACKBURNIAN WARBLER					X
BLACK-THROATED BLUE WARBLER			X		X
BLACK-THROATED GREEN WARBLER			X	X	X
BLUE-WINGED WARBLER	X		X	X	X
BROAD-WINGED HAWK	X		X	X	X
BROWN CREEPER	X		X	X	X
BROWN THRASHER	X	X	X	X	X
CANADA WARBLER			X	X	X
CAROLINA CHICKADEE	X	X	X	X	
CASPIAN TERN		X			
CATTLE EGRET	X	X			X
CERULEAN WARBLER	X			X	X
CHIMNEY SWIFT	X	X	X	X	X
CHUCK-WILL'S-WIDOW	X			X	
CLAPPER RAIL	X	X			
CLIFF SWALLOW			X		X
COLONIAL WATERBIRD FORAGING HABITAT	X	X	X	X	
COLONIAL WATERBIRD NESTING HABITAT		X			
COMMON MOORHEN	X		X		X
COMMON NIGHTHAWK			X	X	X
COMMON TERN	X				X
DICKCISSEL			X		
EASTERN BLUEBIRD	X		X	X	X
EASTERN KINGBIRD	X	X	X	X	X
EASTERN MEADOWLARK	X		X	X	X
EASTERN TOWHEE	X	X	X	X	X
EASTERN WOOD-PEWEE	X		X	X	X
FIELD SPARROW	X		X	X	X
FORSTER'S TERN	X	X			
GLOSSY IBIS	X	X	X		
GOLDEN-WINGED WARBLER					X
GRAY CATBIRD	X	X	X	X	X
GRAY-CHEEKED THRUSH	X			X	X
GREAT BLUE HERON	X	X	X	X	X
GREAT EGRET	X	X	X		
GULL-BILLED TERN		X			
HAIRY WOODPECKER	X	X	X	X	X

Appendix VII. (Cont.)

Common Name	*Delaware Bay*	*Coastal*	*Piedmont Plains*	*Pinelands*	*Skylands*
Priority Species					
HERMIT THRUSH			X	X	X
HOODED WARBLER	X		X	X	X
HORNED LARK			X	X	X
KENTUCKY WARBLER	X		X	X	X
KING RAIL	X				
LEAST BITTERN	X		X	X	X
LEAST FLYCATCHER			X	X	X
LITTLE BLUE HERON	X	X	X	X	
LOUISIANA WATERTHRUSH	X		X		X
MARSH WREN	X	X	X	X	X
NORTHERN BOBWHITE	X	X	X	X	X
NORTHERN PARULA	X		X	X	X
NORTHERN SAW-WHET OWL			X	X	X
PINE WARBLER	X	X	X	X	X
PRAIRIE WARBLER	X		X	X	X
PROTHONOTARY WARBLER	X		X	X	
PURPLE FINCH			X		X
RED CROSSBILL				X	
RED-BREASTED NUTHATCH	X		X	X	X
RED-EYED VIREO	X	X	X	X	X
ROSE-BREASTED GROSBEAK	X		X	X	X
SALTMARSH SHARP-TAILED SPARROW	X	X			
SANDERLING	X	X			
SCARLET TANAGER	X		X	X	X
SEASIDE SPARROW	X	X			
SHARP-SHINNED HAWK	X	X	X	X	X
SNOWY EGRET	X	X	X	X	
BLUE-HEADED VIREO					X
SPOTTED SANDPIPER	X		X	X	X
TERN SPECIES FORAGING HABITAT	X	X	X	X	
TRICOLORED HERON	X	X			
VEERY		X	X	X	X
VIRGINIA RAIL	X	X	X	X	X
WHIMBREL	X	X			
WHIP-POOR-WILL	X		X	X	X
WHITE-EYED VIREO	X		X	X	X
WILLET	X	X			
WILLOW FLYCATCHER	X		X	X	X
WINTER WREN					X
WOOD THRUSH	X	X	X	X	X
WORM-EATING WARBLER	X		X	X	X
YELLOW-BILLED CUCKOO	X	X	X	X	X
YELLOW-BREASTED CHAT	X		X	X	X
YELLOW-THROATED VIREO	X		X	X	X
Herptiles					
Federal T or E					
BOG TURTLE		X	X	X	X

Appendix VII. (Cont.)

Common Name	*Delaware Bay*	*Coastal*	*Piedmont Plains*	*Pinelands*	*Skylands*
State Endangered					
BLUE-SPOTTED SALAMANDER			X		X
COPE'S GRAY TREEFROG	X			X	
CORN SNAKE	X			X	
EASTERN TIGER SALAMANDER	X	X	X	X	
TIMBER RATTLESNAKE	X			X	X
State Threatened					
EASTERN MUD SALAMANDER			X		
LONGTAIL SALAMANDER			X		X
NORTHERN PINE SNAKE	X		X	X	
PINE BARRENS TREEFROG	X		X	X	
WOOD TURTLE			X	X	X
Priority Species					
CARPENTER FROG	X	X	X	X	X
COASTAL PLAIN MILK SNAKE			X	X	
EASTERN BOX TURTLE	X	X	X	X	X
EASTERN KINGSNAKE	X	X	X	X	
FOWLER'S TOAD	X	X	X	X	X
JEFFERSON SALAMANDER			X		X
MARBLED SALAMANDER	X	X		X	X
NORTHERN COPPERHEAD			X		X
NORTHERN DIAMONDBACK TERRAPIN	X	X	X	X	X
NORTHERN SPRING SALAMANDER			X	X	X
SPOTTED TURTLE	X	X	X	X	X
Invertebrates					
Federal Tor E					
AMERICAN BURYING BEETLE			X		X
MITCHELL'S SATYR					X
NORTHEASTERN BEACH TIGER BEETLE		X			
State Endangered					
APPALACHIAN GRIZZLED SKIPPER					X
AROGOS SKIPPER				X	X
BRONZE COPPER	X		X		
State Threatened					
SILVER-BORDERED FRITILLARY	X			X	X
CHECKERED WHITE			X		
FROSTED ELFIN	X		X	X	
Priority Species					
DOTTED SKIPPER	X		X	X	
GEORGIA SATYR				X	
HARISS CHECKERSPOT			X		X
HESSEL'S HAIRSTREAK	X			X	

Appendix VII. (Cont.)

Common Name	*Delaware Bay*	*Coastal*	*Piedmont Plains*	*Pinelands*	*Skylands*
Priority Species					
HOARY ELFIN				X	
NORTHERN METALMARK					X
TWO-SPOTTED SKIPPER			X	X	
Mammals					
Federal T or E					
INDIANA BAT					X
State Endangered					
ALLEGHENY WOODRAT			X		X
BOBCAT	X		X	X	X

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Attachment B: Executive Summary of First Stakeholder Implementation Meeting (February 23, 2006)

Summary Report on the
First Wildlife Action Plan Stakeholder Meeting
Environmental Law Institute
to
New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program

March 2006

Executive Summary

The First Wildlife Action Plan Stakeholder Meeting was held on Thursday, February 23, 2006 at Duke Farms in Hillsboro, New Jersey. The primary goal of the meeting was to solicit stakeholder input into prioritizing the top ten high priority statewide conservation goals among the 63 listed in the New Jersey Wildlife Action Plan.

Twenty of the state-level goals were discussed, debated, and consolidated. The over 40 stakeholders in attendance were then asked to rank, from 1-10, the top state-level goals. The outcome of that ranking exercise can be found at Appendix H. This final list of the priority state-level goals has been edited slightly by the New Jersey Division of Fish and Wildlife's Endangered and Nongame Species Program staff to more accurately reflect the issues raised by stakeholders at the meeting.

Participants stated that there were four issues that, although possibly implicit, should be a critical component to meeting the top priority goals. These include the following:

1. Public education and outreach should be an integral tool for meeting all of the priority goals;
2. Conservation efforts designed to meet these priority goals should include conservation strategies specific to urban and suburban areas;
3. Adaptive management techniques should be used to meet the priority goals. Monitoring will be critical to determining the appropriate adaptive management strategies; and
4. The priority goals are explicitly designed to address threats to all species of greatest conservation concern.

Background

On Thursday, February 23, 2006, the Conserve Wildlife Foundation of New Jersey (CWF) and Environmental Law Institute (ELI) convened the first of what is currently planned to be three wildlife action plan stakeholder meetings in partnership with the New Jersey Department of Environmental Protection's Division of Fish and Wildlife (DFW).

The New Jersey Wildlife Action Plan, a proactive plan to conserve wildlife before they become more rare and more costly to protect, was submitted to the U.S. Fish and Wildlife Service October 1, 2005. (Copies of the plan are available at: <http://www.state.nj.us/dep/fgw/ensp/waphome.htm>.) The multi-scale plan identifies threats, conservation goals, and conservation actions at the state-level, landscape-level (5 regions plus the ocean), and sub-regional level.

The stakeholder meetings are designed to solicit input from a diverse array of stakeholders and achieve the following objectives:

1. Identify the agency's high-, medium-, and low priority state-level conservation goals;
2. Identify the high priority conservation strategies necessary for meeting the high priority state-level goals; and
3. Develop a process for soliciting feedback from partner organizations on implementation successes and obstacles.

Summary of First Stakeholder Meeting

Meeting Goals and Advance Preparation

The First Wildlife Action Plan Stakeholder Meeting was held from 9:00 am – 3:00 pm on Thursday, February 23, 2006 at the Coach Barn at Duke Farms. Both the facility and refreshments were provided through a generous donation from the Doris Duke Charitable Foundation. (See Appendix A for Agenda.)

The objectives of the First Stakeholder Meeting were to:

- Review the pre-selected high priority goals;
- Discuss and organize the high priority goals; and
- Rank the top ten high priority goals

Over 60 stakeholders were invited to attend the meeting. CWF received positive RSVPs from 55 individuals and 44 stakeholders attended the meeting (see Appendix B for list of attendees).

The primary goal of this first meeting was to identify and prioritize the top ten high priority state-level conservation goals. In preparation for the working meeting, the invited stakeholders were asked to review *in advance* the 63 state-level goals outlined in the New Jersey Wildlife Action Plan (see

Appendix C) and identify five high priority goals and ten medium priority goals only. Seventeen of the invited participants returned their ranking forms to DEP in advance of the meeting. In addition, five ranking forms were submitted by all of the DFW's Endangered and Nongame Species Program (ENSP) regionally-based biologists. (See Appendix D for the list of participants who provided ranking forms.)

Introductory Sessions
David Chanda, Director of DEP's Division of Fish and Wildlife, gave welcoming remarks and thanked all of the stakeholders for their participation and support. Jessica Wilkinson, Director of ELI's State Biodiversity Program, served as the facilitator and gave the participants an overview of the meeting objectives.

Larry Niles, Chief of DFW's Endangered and Nongame Species Program, provided the attendees with background on the purpose of the New Jersey Wildlife Action Plan, its basis in the Landscape Project, and stated that the plan is designed to be a blueprint for wildlife conservation for the full array of conservation partners in the state, not solely the Division of Fish and Wildlife. Kris Schantz, Senior Zoologist with ENSP, provided participants with an overview of the public comments received to date. She stated that DFW received 89 distinct letters over a 13-week public comment period. These comments were summarized into 50 distinct comments and recommendations. Thirty-eight of these comments were anti-hunting related or expressed support for the "Trap, Neuter, Release Program" for feral cat colonies. The remaining 12 comments focused on implementation efforts. These included comments about potential partnerships, the need for on-going research throughout the state, a desire to focus conservation efforts in suburban and urban areas, issues regarding off-road vehicles, and emergency response planning. These issues will be revisited and incorporated, where appropriate, during the development of the implementation plan.

Following a brief question and answer session, Emile D. DeVito, Manager of Science and Stewardship for the New Jersey Conservation Foundation and a member of the Endangered and Nongame Species Advisory Committee, provided attendees with an overview of the threats facing wildlife in New Jersey statewide. The presentation drew heavily from Section I. E. of the Wildlife Action Plan.

Discussion of Priority State-Level Conservation Goals
The majority of the remainder of the day was devoted to a discussion of the top high priority goals selected by the stakeholders in advance. The participants were presented with a list of the top 15 high priority goals identified by invitees in advance of the meeting (see Appendix E, Section I). After a review of these 15 high priority goals, participants were then allowed to add back onto the list items that received fewer votes, but were considered a particular priority. In addition to the 15 pre-selected goals, an additional 5 goals were added back to the list (see

Appendix E, Section II). As a result, 20 state-level goals were selected for further discussion (see Appendix E).

The stakeholders discussed each of the top 20 state-level goals in turn. Participants were asked to provide input if they needed further clarification on the goal being discussed. They were also asked to advocate strongly for or against the goal at hand. During this lengthy discussion, participants were given leeway to debate many issues related to the goals, as well as organize the goals where they felt there were significant redundancies. As a result, at the end of the open discussion of the state-level goals, the original list of 20 (15 plus the 5 added back in) was consolidated to 14 state-level goals (see Appendix F).

Final Ranking Exercise

Participants were provided with a list of these 14 revised state-level goals (Appendix F) and asked to rank the top 10 goals in order of 1-10, with one being the highest priority. The results of that ranking exercise can be found in Appendix G. This final list of the top 13 state-level goals has been edited slightly by ENSP staff to more accurately reflect the issues raised by stakeholders at the meeting. Most significantly, goals #6 and #13 were combined, yielding a final list of 13 state-level goals. Appendix H reflects the final, edited version of the ranking exercise.

Preamble Issues

Several issues were identified by the participants as those that were of particular importance as to warrant inclusion in any preamble to the final list of high priority state-level goals. Although many of these issues may be implicitly included in the priority goals, participants felt that they were important enough to warrant an explicit mention. These included the following:

1. Public education and outreach should be an integral tool for meeting all of the priority goals;
2. Conservation efforts designed to meet these priority goals should include conservation strategies specific to urban and suburban areas;
3. Adaptive management techniques should be used to meet the priority goals. Monitoring will be critical to determining the appropriate adaptive management strategies; and
4. The priority goals are explicitly designed to address threats to all species of greatest conservation concern.

Coalition Building and Closing Statements

Troy Ettel, Director of Conservation & Stewardship for New Jersey Audubon Society, discussed with the attendees the need to build a New Jersey coalition to support efforts to secure full implementation of and necessary funding for the New Jersey Wildlife Action Plan. Additional resources and information on the national coalition building effort can be found through the web site of the International Association of Fish & Wildlife Agencies at: <http://www.teaming.com/ctk/>. More general information the State Wildlife

Grants program, state wildlife action plans, and the communications toolkit for the state wildlife actions plan can also be found at <http://www.teaming.com/>.

Larry Niles, Chief of DEP's Endangered and Nongame Species Program, provided closing statements. He stated that a report (provided here) would be made available to the attendees summarizing the day's discussion and the outcome of the ranking and that this stakeholder meeting was the first in a series of meetings envisioned for soliciting input into and support for implementation of the New Jersey Wildlife Action Plan. He concluded by thanking the attendees for their input and participation.

APPENDICIES:
A: Final Agenda
B: List of Attendees
C: 63 State-Level Goals
D: List of participants who provided ranking forms
E: Top 20 High Priority Goals
F: Final Ranking Form – Top 14 Consolidated Goals
G: Outcome of Final Ranking
H: Final Ranking –Prioritized State-Level Goals

ConserveWildlife
FOUNDATION OF NJ

First Wildlife Action Plan Stakeholder Meeting

February 23, 2006
9:00 am – 3:00 pm

Duke Farms
Coach Barn

FINAL AGENDA

8:30 – 9:00 **Coffee and Registration**

9:00 – 9:15 **Welcoming Remarks**
David Chanda, Director
Division of Fish and Wildlife
New Jersey Department of Environmental Protection

9:15 – 9:30 **Introductions, Objectives, Review of Agenda**
Jessica Wilkinson (Facilitator)
Environmental Law Institute

9:30 – 9:45 **Review Background and Purpose of the New Jersey Wildlife Action Plan**
Larry Niles, Chief
Endangered and Nongame Species Program
DEP, Division of Fish & Wildlife

9:45 – 10:00 **Summary of Public Comments**
Kris Schantz, Senior Zoologist
Endangered and Nongame Species Program
DEP, Division of Fish & Wildlife

10:00 – 10:15 **Questions & Answers**

10:15 – 10:30 BREAK

10:30 – 11:00 **Overview of the Statewide Threats**
Emile D. DeVito, Ph.D., Manager of Science and Stewardship
New Jersey Conservation Foundation
Endangered and Nongame Species Advisory Committee

11:00 – 11:15 **Questions & Answers**

11:15 – 12:00 **Presentation and Discussion of Top 20-25 Statewide Goals**

12:00 – 12:45 LUNCH

12:45 – 1:30 **Presentation and Discussion of Top 20-25 Statewide Goals** (continued)

1:30 – 2:00 **Further Discussion of Statewide Goals**

2:00 – 2:15 **Ranking**

2:15 – 2:45 **Building the New Jersey Teaming With Wildlife Coalition**
Troy Ettel, Director of Conservation & Stewardship
New Jersey Audubon Society

2:45 – 3:00 **Wrap-Up and Summary of Next Steps**
Larry Niles, Chief
Endangered and Nongame Species Program
DEP, Division of Fish & Wildlife

APPENDIX B

ConserveWildlife FOUNDATION OF NJ

First Wildlife Action Plan Stakeholder Meeting

List of Attendees

First	Last	Organization
Doug	Adamo	National Park Service
Bob	Allen	The Nature Conservancy
Steve	Atzert	Edwin B Forsythe National Wildlife Refuge
Naomi	Avissar	ENSP
Andrea	Bonette	Sourland Planning Council
Janet	Bucknall	USDA APHIS Wildlife Services
John	Bunnell	Pinelands Commission
Dave	Chanda	NJ Div. Fish & Wildlife
Sharon	DeFaclo	ENSP
Emile	DeVito	NJ Conservation Foundation
Mandy	Dey	ENSP
Dante	Dipirro	NJ Highlands Council
Mim	Dunne	DFW
Troy	Ettel	New Jersey Audubon
Jose	Fernandez	Div. of Parks & Forestry
Jose	Fernandez	Parks and Forestry
Leann	Foster-Sitar	American Littoral Society
Pola	Galie	CWF
Dave	Golden	ENSP
Tom	Gravel	Trust for Public Land
Gabor	Grunstein	NJ Farm Bureau
Larry	Herrighty	DFW

APPENDIX B (continued)

First	Last	Organization
George	Howard	NJ State Federation of Sportsmen's Clubs
Dave	Jenkins	ENSP
Robert	Jennings	Morris County Park Commission
Marjorie	Kaplan	Office of Policy, Planning & Science
William	Koch	Great Swamp National Wildlife Refuge
Kerry	Miller	ANJEC
Tom	Niederer	NJ Forestry Association
Larry	Niles	ENSP
Margaret	O'Gorman	CWF
Laurie	Pettigrew	DFW
Jaclyn	Rhoads	Pinelands Preservation Alliance
Kris	Schantz	ENSP
Annette	Scherer	USFWS-Field Office
Howard	Schlegel	Cape May Refuge
Liz	Semple	NJDEP Office of planning and policy
Bill	Sheehan	Hackensack Riverkeeper, Inc.
David	Smart	Natural Resources Conservation Service
Mick	Valent	ENSP
Jessica	Wilkinson	ELI
Nancy	Wittenberg	NJ Builders Assoc. Rep (Giordano Halleran & Ciesla)
Joanna	Wolaver	New Jersey Audubon

Wildlife Action Plan: Implementation Prioritization		
In the following pages, you will find the 63 state-level goals identified in NJ's Wildlife Action Plan. A separate document has also been provided to you with the state-level goals and the conservation strategies identified to accomplish these goals to use for your reference. Please review the following goals and identify **five (5) high priority goals and ten (10) medium priority goals only** and return your completed document via e-mail to Linda Watson at linda.watson@dep.state.nj.us. To insure that your priorities are included in the stakeholders' meeting discussion on February 23rd, please return this file NO LATER than Monday, February 20th, 3:00pm.		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
1. Addressing National, Inter-state, and Statewide Threats			
a. Invasive Terrestrial and Aquatic Species and Exotic Pathogens			
	1) Restore and maintain species of special concern wildlife populations through collaborative protection of native species and habitats.		
	2) Conduct long-term monitoring to evaluate habitat and wildlife restoration efforts.		
	3) Reduce the adverse impacts of invasive, exotic and over-abundant native species on critical wildlife, natural communities, and habitat quality.		
	4) Identify and restore unique ecosystem processes through the control and/or removal of invasive and exotic species.		
b. Suburban Sprawl and Large-acre zoning			
	5) Identify and protect breeding, migration, wintering habitats and landscapes essential for long-term viability of wildlife populations.		
	6) Maintain connectivity of habitats at the landscape scale.		
	7) Encourage creation and enhancement of wildlife habitat on private lands.		
c. Motorized Recreation Vehicles			
	8) Identify and actively protect public natural lands with rare wildlife and heaviest illegal ORV and personal watercraft use.		
	9) Restore and maintain wildlife populations through the collaborative protection of species and habitats from disturbance and habitat degradation by		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
c. Motorized Recreation Vehicles (continued)			
	10) Conduct long-term monitoring to evaluate protection and restoration efforts of both wildlife and their habitats.		
d. Subsidized Predators:			
	11) Reduce impact on wildlife populations of subsidized predator populations, including free-roaming and feral cats.		
	12) Identify and restore more natural predator-prey relationships through the control of subsidized predators and restoration of natural predators.		
e. Oil Spills			
	13) Identify and protect breeding, migratory, and wintering habitats and landscapes essential for long-term viability of wildlife populations with an emphasis on habitats supporting endangered, threatened, and declining wildlife.		
	14) Assess, reduce and mitigate the impacts of oil spills on critical habitat.		
f. Contaminants (point and non-point sources)			
	15) Restore and maintain wildlife populations through the collaborative protection of species and habitats.		
	16) Conduct long-term monitoring to evaluate population viability and protection and restoration efforts of both wildlife and their habitats.		
g. Direct Human Impacts on Native Wildlife and Ecosystem Health			
	17) Eliminate illegal collection of reptiles and amphibians within New Jersey and the release of unwanted exotic species into New Jersey's natural environment.		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
g. Direct Human Impacts on Native Wildlife and Ecosystem Health (continued)			
	18) Identify, protect and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).		
	19) Minimize impacts of controlled water releases on fishes, freshwater mussels, dragonflies, damselflies, and other aquatic organisms.		
	20) Minimize impacts of illegal draw-downs by enforcing existing regulations.		
	21) Minimize impacts of water intake systems on aquatic organisms.		
	22) Minimize acoustic effects to anadromous freshwater fishes and marine mammals and turtles.		
	23) Promote public awareness and conservation.		
	24) Minimize impacts of snag removal and stream cleaning on aquatic species.		
	25) Identify and restore unique ecosystem processes (i.e. fire within the Pinelands).		
h. Development			
	26) Identify and protect breeding, migration, wintering habitats and landscapes essential for the long-term viability of endangered, threatened and declining wildlife populations.		
	27) Restore and maintain wildlife populations through collaborative protection of species and habitats.		
	28) Conduct long-term monitoring to evaluate population viability, protection and restoration efforts of both wildlife and their habitats.		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
h. Development (continued)			
	29) Minimize impacts of dredging, channelization and dam construction on aquatic species.		
	30) Minimize impacts of snag removal and stream cleaning on aquatic species.		
	31) Restore historic anadromous fish spawning habitat to what it was before dam installation to increase population size.		
	32) Minimize acoustic effects to anadromous freshwater fishes and marine mammals and turtles.		
I. Road Mortality of Wildlife			
	33) Identify and protect breeding, migratory, wintering habitats and landscapes essential for long-term viability of endangered, threatened and declining wildlife populations.		
	34) Conduct long-term monitoring to evaluate population viability, protection and restoration efforts of both wildlife and their habitat.		
j. High Deer Densities			
	35) Restore and maintain wildlife populations through collaborative protection of species and habitats.		
	36) Conduct long-term monitoring to evaluate population viability, protection and restoration efforts of both wildlife and their habitat.		
	37) Identify and restore more natural vegetative communities through sustainable, area-specific deer densities.		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
k. Unsustainable Land Management Practices on both Private and Conserved Lands and Waters			
	38) Minimize impacts of agricultural practices on aquatic waterways, ground-nesting birds, reptiles and amphibians.		
	39) Improve communication between farmers, state and private foresters and land stewards of private, local, state and federal lands to develop silviculture plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.		
	40) Investigate impacts of aquaculture on critical habitats and wildlife and develop BMPs to minimize negative impacts.		
	41) Minimize impacts of other potentially deleterious land management practices, such as dune stabilization, stream cleaning, shoreline stabilization, etc., on critical habitats and wildlife.		
2. Endangered, Threatened, and Rare Wildlife			
	42) Maintain viable populations of all rare and nongame wildlife species to ensure their long- term participation in the ecosystems of New Jersey. Restore populations of endangered and threatened wildlife to stable levels that allow their delisting.		
	43) Pursue habitat restoration and enhancement to benefit wildlife species.		
	44) Identify summer distribution, habitat use, and migratory corridors for inter- and intrastate migratory wildlife species of conservation concern (birds, bats, marine mammals, fish) and develop and implement strategies to protect these areas.		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
3. The Landscape Project			
	45) Identify and protect landscapes and habitats essential for long-term viability of wildlife and fish populations of conservation concern.		
4. Migratory Stopover and Important Bird Areas Planning			
	46) Identify, monitor, conserve, and improve key migratory corridors and stopover locations for migratory birds.		
	47) Conserve sites critical to breeding and wintering birds.		
5. Freshwater Riparian and Aquatic Species			
	48) Pursue habitat restoration and enhancement to benefit wildlife species.		
a. Freshwater Mussels			
	49) Protect freshwater mussel species through long-term monitoring, stream classification upgrades and the development of management plans.		
b. Nongame Fish Species			
	50) Determine species status for unregulated fishes using the Delphi Status Review and revise New Jersey nongame wildlife lists (Act, N.J.S.A. 23:2A-1 et. seq; N.J.A.C. 7:25-4.17) through state rulemaking process to include endangered and threatened species.		
	51) Protect listed freshwater species through identification of critical areas, stream classification upgrades, and/or development of management plans with the NJ Department of Environmental Protection, Division of Fish and Wildlife's Bureau of Freshwater Fisheries (BFF) that include long-term monitoring.		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
b. Nongame Fish Species (continued)			
	52) Incorporate occurrence information into the Riparian Landscape Project, develop species models and identify critical areas.		
c. Odonata (Dragonflies and Damselflies)			
	53) Protect listed Odonata through long-term monitoring, stream classification upgrades, and development of management plans.		
6. Game Species of Regional Priority and Concern			
	54) Restore declining populations of game species to viable levels.		
	55) Maintain sustainable populations of all current game species of conservation concern in New Jersey.		
	56) Pursue habitat restoration and enhancement to benefit wildlife species.		
7. Long-term Population Monitoring			
	57) Document distribution, relative abundance, and population trends of wildlife of conservation concern through statewide surveys, atlases, and monitoring programs conducted by professionals and non-professional citizen scientists.		
	58) Review and analyze management efforts focused on the restoration of unique ecosystem processes.		

Topic	State-level Goal	Prioritization (total: 5 high and 10 medium priority goals)	Comments
8. Adaptive Management Practices			
	59) Apply best management practices (BMP) for wildlife and habitat resources in the state, monitor effectiveness and modify BMPs as necessary.		
	60) Maintain Landscape Map database and species based models; improve models as more data become available.		
	61) Monitor research and data evaluation techniques and modify as needed.		
9. Review of Wildlife Action Plan			
	62) Wildlife Action Plan (WAP) is an on-going, dynamic document, to be reviewed every five years.		
	63) Ensure that management plans for federal and state lands are consistent with the NJ WAP and regional goals are implemented in a manner that achieves the overall state and regional goals.		

APPENDIX D

List of Participants Who Submitted Rankings of 63 State-Level Goals

1. Joanna Burger, Rutgers University and Endangered and Nongame Species Program Advisory Committee
2. Chris Sturm,NJ Future
3. Tim Dunne, Department of Agriculture, Natural Resources Conservation Service
4. Nancy Wittenberg, NJ Builders Association Representative
5. Stephen Atzert, Edwin B Forsythe National Wildlife Refuge
6. Annette Scherer, US Fish and Wildlife Service
7. Doug Adamo, National Park Service
8. George Howard, NJ State Federation of Sportsmen's Clubs
9. Leann Foster-Sitar, Esq., American Littoral Society
10. Robert Jennings, Morris County Parks Commission
11. Bill Koch, Great Swamp National Wildlife Refuge
12. Bob Allen, The Nature Conservancy
13. Camille Crichton-Sumners, Department of Transportation, Div. of Project Planning & Development
14. David Smart, Department of Agriculture, Natural Resources Conservation Service
15. John Bunnell, Pinelands Commission
16. Emile DeVito, NJ Conservation Foundation and Endangered and Nongame Species Program Advisory Committee
17. NJ Division of Fish and Wildlife, Endangered and Nongame Species Program's (ENSP) Pinelands biologists
18. ENSP Delaware Bay biologists
19. ENSP Piedmont Plains biologists
20. ENSP Skylands biologists
21. ENSP Coastal biologists

The following stakeholders submitted comments, however they were received after the cutoff for inclusion in the February 23rd Stakeholder Meeting ranking results.

1. Janet Bucknall, Department of Agriculture-Animal and Plant Health Inspection Service
2. Troy Ettel, NJ Audubon Society
3. Andrea Bonette, Sourland Planning Council
4. Howard Schlegel, Cape May Refuge

State-Level Conservation Objectives

Section I. below outlines the top 15 state-level coservation goals identified by stakeholders in advance of the Febraruy 23rd meeting. Section II. includes the five additional state-level goals that participants felt warranted inclusion on the list. In total, the 20 state-level goals listed below are those which participants discussed at length at the First Stakholder Meeting.

I. TOP PRIORITY GOALS IDENTIFED IN ADVANCE

Stakeholders were asked, in advance, to identify the top priority state-level goals. The 15 goals listed below received the highest ranking.

1. Addressing National, Inter-state, and Statewide Threats

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

3. Reduce the adverse impacts of invasive, exotic and over-abundant native species on critical wildlife, natural communities, and habitat quality.
4. Identify and restore unique ecosystem processes through the control and/or removal of invasive and exotic species.

Suburban Sprawl and Large-acre zoning:

5. Identify and protect breeding, migration, wintering habitats and landscapes essential for long-term viability of wildlife populations.
6. Maintain connectivity of habitats at the landscape scale.

Subsidized Predators:

11. Reduce impact on wildlife populations of subsidized predator populations, including free-roaming and feral cats.

Direct Human Impacts on Native Wildlife and Ecosystem Health

18. Identify, protect and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

Development

26. Identify and protect breeding, migration, wintering habitats and landscapes essential for the long-term viability of endangered, threatened and declining wildlife populations.
28. Conduct long-term monitoring to evaluate population viability, protection and restoration efforts of both wildlife and their habitats.

High Deer Densities

37. Identify and restore more natural vegetative communities through sustainable, area-specific deer densities.

Unsustainable Land Management Practices on both Private and Conserved Lands and Waters

39. Improve communication between farmers, state and private foresters and land stewards of private, local, state and federal lands to develop silviculture plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

2. Endangered, Threatened, and Rare Wildlife

42. Maintain viable populations of all rare and nongame wildlife species to ensure their long-term participation in the ecosystems of New Jersey. Restore populations of endangered and threatened wildlife to stable levels that allow their delisting.
43. Pursue habitat restoration and enhancement to benefit wildlife species.

3. The Landscape Project

45. Identify and protect landscapes and habitats essential for long-term viability of wildlife and fish populations of conservation concern.

4. Migratory Stopover and Important Bird Areas Planning

46. Identify, monitor, conserve, and improve key migratory corridors and stopover locations for migratory birds.

7. Long-term Population Monitoring

57. Document distribution, relative abundance, and population trends of wildlife of conservation concern through statewide surveys, atlases, and monitoring programs conducted by professionals and non-professional citizen scientists.

II. ADDITIONAL TOP PRIORITY GOALS

Stakeholders were asked at the meeting, to identify any top priority state-level goals that dropped out of the initial selection, that they felt were essential to consider. The 5 goals listed below reflect those additions.

1. Addressing National, Inter-state, and Statewide Threats

Motorized Recreational Vehicles

8. Identify and actively protect public natural lands with rare wildlife and heaviest illegal ORV and personal watercraft use.

Contaminants (Point and Non-Point Source)

15. Restore and maintain wildlife populations through the collaborative protection of species and habitats.

Direct Human Impacts on Native Wildlife and Ecosystem Health

23. Promote public awareness and conservation.

8. Adaptive Management Practices

59. Apply best management practices (BMP) for wildlife and habitat resources in the state, monitor effectiveness and modify BMPs as necessary.

9. Review of Wildlife Action Plan

63. Ensure that management plans for federal and state lands are consistent with the NJ WAP and regional goals are implemented in a manner that achieves the overall state and regional goals.

ConserveWildlife
FOUNDATION OF NJ

First Wildlife Action Plan Stakeholder Meeting

February 23, 2006
9:00 am – 3:00 pm

Duke Farms
Coach Barn

RANKING FORM

In the chart below, please identify the top TEN high priority state-level goals. Please number the top five goals from 1 – 10, with 1 being the highest.

GOAL NUMBER	GOAL RANK	NOTES
3.		Invasive Terrestrial and Aquatic Species and Exotic Pathogens: Reduce the adverse impacts of invasive, exotic and over-abundant native species on critical wildlife, natural communities, and habitat quality. [*non-native invasives]*
4.		Invasive Terrestrial and Aquatic Species and Exotic Pathogens: Identify, restore, and control unique ecosystem processes through land management practices, including the control and/or removal of invasive and exotic species.
5./26./45.		Suburban Sprawl/ Development/ Landscape Project: Identify and protect breeding, migration, wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.
6.		Suburban Sprawl and Large-acre zoning: Maintain connectivity of habitats at the landscape scale.
11.		Subsidized Predators: Reduce impact on wildlife populations of subsidized predator populations such as raccoons, red fox, American crow, and free-roaming and feral cats.

18.		Direct Human Impacts: Identify, protect and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).
28./ 57.		Development/ Long-term monitoring: Conduct long-term monitoring to evaluate population viability through statewide surveys, atlases, & monitoring programs; and monitor the effectiveness of restoration efforts of both wildlife and their habitats.
37.		High Deer Densities: Identify, maintain, and restore natural vegetative communities through sustainable, area-specific deer densities.
39.		Unsustainable Land Mgmt. Practices: Improve communication between farmers, state and private foresters and land stewards of private, local, state and federal lands to develop habitat management plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.
42./43.		Endangered, Threatened & Rare Wildlife: Maintain viable populations of all rare and nongame wildlife species to ensure their long- term participation in the ecosystems of New Jersey. Restore populations of endangered and threatened wildlife to stable levels that allow their delisting by pursuing habitat restoration & enhancement and protecting critical habitat to benefit wildlife species.
46.		Migratory Stopover & Important Bird Areas: Identify, monitor, conserve, and improve key migratory corridors and stopover locations for migratory birds.
8.		Motorized Recreation Vehicles: Identify and actively protect public natural lands and water w/ rare wildlife and heaviest ORV and personal watercraft use.
15.		Contaminants (point and nonpoint sources): Restore & maintain wildlife populations through the collaborative protection of species and habitats by eliminating or reducing exposure to point and nonpoint source contamination.
63.		Review of WAP: Ensure that management plans for federal, state, county, municipal, and private lands (NGOs) are consistent with the NJ WAP and regional goals are implemented in a manner that achieves the overall state and regional goals.

APPENDIX G: Wildlife Action Plan: Implementation Prioritization - INTERIM RESULTS

The following high-priority state-level goals were valued 1-10 (1 = Highest Priority). In order to determine the prioritization, those goals NOT selected by stakeholders were given a value of 14 (the "lowest" value possible).

Topic	State-level Goal	Prioritization for DFW/DPF as a Group	Bill Koch	Steve Atzert	Tom Gravel	Tom Niederer	Kerry Miller	Liz Semple	Howard Schleger	Doug Adamo	Emile DeVito	Troy Ettel	John Bunnell	Andrea Bonnette	David Smart	Bob Allen	Annette Scherer	Robert Jennings	Jaclyn Rhoads	Bill Sheehan	No name 1	No name 2	No name 3	Totals
	5/26/45) Identify and protect breeding, migration, wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.	2	4	3	3	14	1	1	1	8	4	2	6	7	2	1	1	10	1	10	1	14	1	**97**
	42/43) Maintain viable populations of all rare and nongame wildlife species to ensure their long- term participation in the ecosystems of New Jersey. Restore populations of endangered and threatened wildlife to stable levels that allow their delisting by pursuing habitat restoration and enhancement and protecting critical habitat to benefit wildlife species.	1	3	14	6	10	7	14	2	3	2	1	10	6	4	2	2	9	4	14	2	14	4	**134**
	4) Identify, restore, and control unique ecosystem processes through land management practices, including the control and/or removal of invasive and exotic species.	14	2	1	10	3	5	3	6	2	10	5	2	4	14	5	7	7	10	2	14	3	14	**143**
	46) Identify, monitor, conserve, and improve key migratory corridors and stopover locations for migratory birds.	4.5	10	5	7	8	2	5	10	6	9	9	9	2	5	3	8	5	6	3	14	10	6	**146.5**
	39) Improve communication between farmers, state and private foresters and land stewards of private, local, state and federal lands to develop habitat management plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.	7	9	6	2	1	6	4	14	14	5	8	14	1	1	14	4	4	5	6	3	14	10	**152**
	3) Reduce the adverse impacts of [non-native] invasive, exotic and over-abundant native species on critical wildlife, natural communities, and habitat quality.	8	1	2	14	5	14	14	3	5	3	4	3	14	9	14	14	6	14	9	4	1	2	**163**
	18) Identify, protect and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).	4.5	8	10	14	6	4	2	14	14	8	10	5	10	3	6	3	14	2	1	14	14	5	**171.5**
	6) Maintain connectivity of habitats at the landscape scale.	6	7	4	1	14	14	14	7	10	14	6	1	9	6	4	9	2	3	14	14	2	14	**175**
	28/57) Conduct long-term monitoring to evaluate population viability through statewide surveys, atlases, & monitoring programs; and monitor the effectiveness of protection and restoration efforts of both wildlife and their habitats.	3	5	14	9	14	9	9	8	7	7	7	7	14	14	8	10	3	8	14	5	6	3	**184**
	37) Identify, maintain, and restore more natural vegetative communities through sustainable, area-specific deer densities.	14	6	7	14	2	3	6	14	14	1	3	4	3	8	7	14	8	14	14	14	4	14	**188**
	15) Restore and maintain wildlife populations through the collaborative protection of species and habitats by eliminating or reducing exposure to point and nonpoint source contamination.	14	14	8	4	9	14	14	9	1	14	14	14	8	10	9	5	14	14	5	14	9	8	**225**
	8) Identify and actively protect public natural lands and water with rare wildlife and heaviest ORV and personal watercraft use.	10	14	14	8	7	8	14	4	9	6	14	14	14	14	10	14	14	7	4	14	5	9	**227**
	11) Reduce impact on wildlife populations by subsidized predator populations such as raccoons, red fox, American crow, and free-roaming and feral cats.	14	14	9	14	4	10	7	5	4	14	14	8	5	14	14	6	14	14	8	14	7	14	**227**
	63) Ensure that management plans for federal, state, county, municipal, and private (NGOs) lands are consistent with the NJ WAP and regional goals are implemented in a manner that achieves the overall state and regional goals.	9	14	14	5	14	14	8	14	14	14	14	14	14	14	63	14	14	14	7	14	8	7	**317**

APPENDIX H

State-Level Conservation Objectives Prioritization Results

The following state-level conservation goals have been selected as implementation priorities from the New Jersey Wildlife Action Plan. On Thursday, February 23, 2006 the First Wildlife Action Plan Stakeholder Meeting was held at Duke Farms in Hillsboro, New Jersey. The primary goal of the meeting was to solicit stakeholder input into prioritizing the top ten priority statewide conservation goals among the 63 listed in the New Jersey Wildlife Action Plan. The goals listed below reflect the input of stakeholders prior to and at the meeting. This final list of priority state-level goals has been edited slightly by ENSP staff to more accurately reflect the issues raised by stakeholders at the meeting. They are listed in order of the priority assigned by stakeholders.

Stakeholders stressed that the following four issues should be a critical component to meeting the top priority goals.

1. Public education and outreach should be an integral tool for meeting all of the priority goals;
2. Conservation efforts designed to meet these priority goals should include conservation strategies specific to urban and suburban areas;
3. Adaptive management techniques should be used to meet the priority goals. Monitoring will be critical to determining the appropriate adaptive management strategies; and
4. The priority goals are explicitly designed to address threats to all species of greatest conservation concern.

Ranking (1-10; 1=highest priority)	**Main Topic/Issue (may include combinations of issues)**	**Goal (may include combinations of goals)**
1	Addressing National, Inter-state, and Statewide Threats AND The Landscape Project	Identify and protect breeding, migration, wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.
2	Endangered, Threatened, and Rare Wildlife	Restore populations of endangered and threatened wildlife to stable levels that allow their delisting by population management, protecting critical habitat, and habitat restoration and enhancement.

APPENDIX H (continued)

Ranking (1-10; 1=highest priority)	Main Topic/Issue (may include combinations of issues)	Goal (may include combinations of goals)
3	Addressing National, Inter-state, and Statewide Threats	Identify, restore, and protect unique ecosystem processes including the control and/or removal of invasive and exotic species, fire management, and delayed and alternate patch mowing.
4	Migratory Stopover and Important Bird Areas Planning	Identify, monitor and conserve, key migratory corridors and stopover locations for migratory birds.
5	Addressing National, Inter-state, and Statewide Threats	Improve communication between farmers foresters and land stewards of private, local, state and federal lands to develop habitat management plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.
6	Addressing National, Inter-state, and Statewide Threats	Reduce the adverse impacts of non-native invasive species, subsidized predators, and over-abundant native species on critical wildlife, natural communities, and habitat quality.
7	Addressing National, Inter-state, and Statewide Threats	Identify, protect and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).
8	Addressing National, Inter-state, and Statewide Threats	Maintain connectivity of habitats at the landscape scale.
9	Addressing National, Inter-state, and Statewide Threats AND Long-Term Monitoring	Conduct long-term monitoring to evaluate population viability through statewide surveys, atlases, and effectiveness of protection and restoration efforts of both wildlife and their habitats.
10	Addressing National, Inter-state, and Statewide Threats	Identify, maintain, and restore natural vegetative communities through sustainable, area-specific deer densities.

APPENDIX H (continued)

Ranking (1-10; 1=highest priority)	Main Topic/Issue (may include combinations of issues)	Goal (may include combinations of goals)
11	Addressing National, Inter-state, and Statewide Threats	Restore and maintain wildlife populations by eliminating or reducing exposure to point and nonpoint source contamination.
12	Addressing National, Inter-state, and Statewide Threats	Identify and actively protect public natural lands and water with rare wildlife from ORV and personal watercraft use.
13	Review of Wildlife Action Plan	Ensure that conservation activities of federal, state, county, municipal, and private (NGOs) lands affecting species of conservation concern are consistent with the NJ WAP.

Attachment C: Executive Summary of Second Stakeholder Implementation Meeting (April 6, 2006)

Summary Report on the Second Wildlife Action Plan Stakeholder Meeting

Environmental Law Institute to New Jersey Department of Environmental Protection Division of Fish and Wildlife Endangered and Nongame Species Program

May 2006

Executive Summary

In February 2006, the New the Conserve Wildlife Foundation of New Jersey and Environmental Law Institute, in partnership with the New Jersey Department of Environmental Protection's Division of Fish and Wildlife (DFW), convened over 40 stakeholders to discuss and rank the top state-level goals identified in the New Jersey Wildlife Action Plan. Stakeholders identified 13 priority state-level goals, which can be found in Appendix C.

The Second Wildlife Action Plan Stakeholder Meeting was held on Thursday, April 6, 2006, at Duke Farms in Hillsboro, New Jersey. The primary goal of the meeting was to solicit stakeholder input into prioritizing state-level conservation strategies associated with the 13 priority state-level conservation goals identified at the First Stakeholder Meeting. Participants discussed and debated the state-level conservation strategies and provided their input on prioritizing the strategies. The outcome of that exercise can be found in Appendix E.

Background

On Thursday, April 6, 2006, the Conserve Wildlife Foundation of New Jersey (CWF) and Environmental Law Institute (ELI) convened the second of a series of wildlife action plan stakeholder meetings in partnership with the New Jersey Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW).

The New Jersey Wildlife Action Plan, a proactive plan to conserve wildlife before they become more rare and more costly to protect, was submitted to the U.S. Fish and Wildlife Service October 1, 2005. (Copies of the plan are available at: <http://www.state.nj.us/dep/fgw/ensp/waphome.htm>.) The multi-scale plan identifies threats, conservation goals, and conservation actions at the state-level,

landscape-level (5 regions, including the ocean), and sub-regional level (identified as conservation zones within NJ's plan).
The stakeholder meetings are designed to solicit input from a diverse array of stakeholders and achieve the following objectives:

1. Identify the state's high-, medium-, and low priority state-level conservation goals;
2. Identify the high priority conservation strategies necessary for meeting the high priority state-level goals; and
3. Develop a process for soliciting feedback from partner organizations on implementation successes and obstacles.

Summary of First Stakeholder Meeting
The First Wildlife Action Plan Stakeholder Meeting was held from 9:00 am – 3:00 pm on Thursday, February 23, 2006, at the Coach Barn at Duke Farms.

The objectives of the First Stakeholder Meeting were to:

- Review the pre-selected high priority goals;
- Discuss and organize the high priority goals; and
- Rank the high priority goals

Over 40 stakeholders attended the meeting. The primary goal of this first meeting was to identify and prioritize the high priority state-level conservation goals**.** The outcome of the ranking exercise can be found in Appendix C.

Summary of Second Stakeholder Meeting

Meeting Goals and Advance Preparation
The Second Wildlife Action Plan Stakeholder Meeting was held from 9:00 am – 4:00 pm on Thursday, April 6, 2006, at the Coach Barn at Duke Farms. The Doris Duke Charitable Foundation generously provided the facility. Refreshments were provided by the Conserve Wildlife Foundation of New Jersey. (See Appendix A for Agenda.)

The objectives of the Second Stakeholder Meeting were to:

- Present stakeholders with prioritized state-level goals as decided at First Stakeholder Meeting;
- Discuss the conservation strategies associated with the prioritized state-level goals; and
- Seek stakeholder input to select priority conservation strategies.

Over 60 stakeholders were invited to attend the meeting. CWF received positive RSVPs from 55 individuals and 44 stakeholders attended the meeting (see Appendix B for list of attendees).

The primary goal of this first meeting was to prioritize the top state-level conservation strategies necessary to meet the goals identified in the First Stakeholder Meeting. In preparation for the working meeting, the invited stakeholders were asked to review *in advance* an initial list of conservation strategies that showed those selected as priorities by the staff of DFW's Endangered and Nongame Species Program (ENSP) and the remaining strategies identified within NJ's Wildlife Action Plan (see appendix D). Participants were asked to review the list of strategies in advance. The list was the basis of the discussion at the Second Stakeholder Meeting.

Introductory Sessions
John S. Watson, Jr., Deputy Commissioner for Natural Resources at DEP gave welcoming remarks and thanked all of the stakeholders for their participation and support. Jessica Wilkinson, Director of ELI's State Biodiversity Program, served as the facilitator and gave the participants an overview of the meeting objectives.

Larry Niles, Chief of ENSP, provided the attendees with background on the purpose of the New Jersey Wildlife Action Plan, its basis in the Landscape Project, and stated that the plan is designed to be a blueprint for wildlife conservation for the full array of conservation partners in the state, not solely the Division of Fish and Wildlife. Dave Jenkins, Principal Biologist with ENSP, provided an overview of the results from the First Stakeholder Meeting. These presentations were followed by a brief question and answer session.

Discussion of State-Level Conservation Strategies
The majority of the remainder of the day was devoted to a discussion of the conservation strategies associated with the high priority goals selected by the stakeholders. The participants were presented with a list of conservation strategies pre-selected by ENSP (Appendix D). Each goal and its associated strategies were presented and participants were asked to offer comments on which strategies they felt should be of particular priority. Participants also sought clarification on some of the priorities. During this lengthy discussion, participants were given leeway to debate many issues related to the goals and strategies, as well as add back to the list any of the priorities that ENSP did not identify among the priority strategies.

Final Exercise
The ENSP staff incorporated the participants' comments and refined the newly created list of priority strategies to include measurable outcomes, many of which were addressed during the meeting.

Preamble Issues
Two issues were identified by the participants as those that were of particular importance as to warrant inclusion in any preamble to the final list of prioritized state-level goals and strategies. Although many of these issues may be implicitly

included in the priority goals, participants felt that they were important enough to warrant an explicit mention.

1. Public education and outreach should be an integral tool for meeting all of the priority goals; and
2. Adaptive management techniques should be used to meet the priority goals. Monitoring will be critical to determining the appropriate adaptive management strategies.

Securing Long-Term Funding for Land Protection and Coalition Building
Michael Catania, President of Conservation Resources, Inc., provided participants with an overview of plans to secure long-term funding for land protection in New Jersey. He summarized the current status of the Green Acres program and Garden State Preservation Trust (GSPT), which together have fueled a surge of state land acquisition and farmland preservation, as well as matching grants and low cost loans to local governments, and matching grants to non-profit conservation organizations. In turn, these state funds have been leveraged by dedicated open space taxes that have been approved by local voters in all 21 counties and in almost 250 of the state's 566 municipalities. Private funding generated by non-profit land trusts have further leveraged these public funds, as have below-market sales by private landowners who can claim a charitable contribution deduction against the New Jersey state income tax.

GSPT, however, is expected to begin running out by the end of 2006. Although the Corzine administration has expressed support for renewing the Trust, the state is expecting an estimated budget deficit of up to $6 billion for FY 2007, and needs to address other pressing issues, such as the near bankruptcy of the Transportation Trust Fund and school construction fund. Catania recommended that in 2006, conservation agencies and organizations lay the groundwork for continued funding for open space preservation with the hopes of having a bond initiative on the ballet in 2007. Catania recommended that Corzine reappoint the Governor's Council on New Jersey Outdoors, or a similar group, an approach that has been used successfully by two previous governors, to study the remaining need for open space and farmland preservation funding.

Sean Robertson, the Teaming With Wildlife Coalition and Communications Assistant at the Association of Fish & Wildlife Agencies (AFWA, formerly known as the International Association of Fish and Wildlife Agencies), gave a presentation on building the Teaming With Wildlife Coalition in New Jersey and nationally. AFWA has developed significant materials for partner agencies and organizations to both communicate to the public about the importance of the state wildlife action plans and to work with partners to build state coalitions to support future funding for implementation of the plans. These materials are all available through the AFWA web site at: www.iafwa.org and www.teaming.com.

Both presentations were followed by a brief question and answer period.

Wrap-Up
Larry Niles, Chief of DEP's Endangered and Nongame Species Program, provided closing statements. He stated that a report (provided here) would be made available to the attendees summarizing the day's discussion and the outcome of the prioritization exercise. He added that this stakeholder meeting was the second in a series of meetings envisioned to solicit input into and support for implementation of the New Jersey Wildlife Action Plan. He concluded by thanking the attendees for their input and participation.

APPENDICIES:
A: Second Stakeholder Meeting Final Agenda
B: Second Stakeholder Meeting List of Participants
C: First Stakeholder Meeting Summary – Final Prioritized State-Level Goals
D: Second Stakeholder Meeting – Priority State-Level Goals and Strategies (provided in advance)
E: Second Stakeholder Meeting Summary – Final State-Level Conservation Goals and Strategies

APPENDIX A

Second Wildlife Action Plan Stakeholder Meeting

April 6, 2006
9:00 am – 4:00 pm

Duke Farms
Coach Barn

DRAFT AGENDA

8:30 – 9:00 **Coffee and Registration**

9:00 – 9:15 **Welcoming Remarks**
John S. Watson, Jr., Deputy Commissioner for Natural Resources
New Jersey Department of Environmental Protection

9:15 – 9:30 **Introductions, Objectives, Review of Agenda**
Jessica Wilkinson (Facilitator)
Environmental Law Institute

9:30 – 9:45 **Review Background and Purpose of the New Jersey Wildlife Action Plan**
Larry Niles, Chief
Endangered and Nongame Species Program
DEP, Division of Fish & Wildlife

9:45 – 10:15 **Summary of Priority State-Level Conservation Goals**
Dave Jenkins, Principal Biologist
Endangered and Nongame Species Program
DEP, Division of Fish & Wildlife

10:15 – 10:30 **Questions & Answers**

10:30 – 10:45 BREAK

10:45 – 12:00 **Presentation and Discussion of Conservation Strategies**

12:00 – 1:00 LUNCH

1:00 – 2:30 **Presentation and Discussion of Conservation Strategies** (continued)

APPENDIX A (continued)

2:30 – 2:45 BREAK

2:45 – 3:05 **Securing Long-Term Funding for Land Protection In New Jersey**
Michael Catania, President, Conservation Resources, Inc.

3:05 – 3:15 Questions & Answers

3:15 – 3:35 **Building the Teaming with Wildlife Coalition**
Sean Robertson
Teaming With Wildlife Coalition and Communications Assistant
International Association of Fish & Wildlife Agencies

3:35 – 3:50 Questions & Answers

3:50– 4:00 **Wrap-Up and Summary of Next Steps**
Larry Niles, Chief
Endangered and Nongame Species Program
DEP, Division of Fish & Wildlife

APPENDIX B

Second Wildlife Action Plan Stakeholder Meeting

List of Attendees

First	Last	Organization	Invited	Attended
Doug	Adamo	National Park Service	X	
Steve	Atzert	Edwin B Forsythe National Wildlife Refuge	X	X
Jennifer	Bryson	Sourland Planning Council	X	X
Barbara	Brummer	The Nature Conservancy – NJ Chapter	X	X
Janet	Bucknall	USDA APHIS Wildlife Services	X	X
John	Bunnell	Pinelands Commission	X	X
Joanna	Burger	Rutgers University	X	X
Michael	Catania	Conservation Resources, Inc.	X	
Dave	Chanda	NJ Div. Fish & Wildlife	X	X
Sharon	DeFalco	ENSP		
Emile	DeVito	NJ Conservation Foundation	X	X
Mandy	Dey	ENSP	X	X
Dante	Dipirro	NJ Highlands Council	X	
Bill	Dressel	NJ League of Municipalities	X	
Mim	Dunne	DFW	X	
Naomi	Edelson	Association of Fish and Wildlife Agencies	X	
Troy	Ettel	New Jersey Audubon	X	X
Jose	Fernandez	Div. of Parks & Forestry	X	
John	Flynn	DEP, Green Acres	X	
Leann	Foster-Sitar	American Littoral Society	X	
Pola	Galie	Conserve Wildlife Foundation	X	X
Dave	Golden	ENSP		
Tom	Gravel	Trust for Public Land	X	X
Gabor	Grunstein	NJ Farm Bureau	X	X
Larry	Herrighty	DFW	X	

APPENDIX B (continued)

First	Last	Organization	Invited	Attended
George	Howard	NJ State Federation of Sportsmen's Clubs	X	
Dave	Jenkins	ENSP	X	X
Robert	Jennings	Morris County Park Commission	X	X
Andrew	Johnson	The William Penn Foundation	X	
Russel	Juelg	Pinelands Preservation Alliance	X	X
Marjorie	Kaplan	Office of Policy, Planning & Science	X	
Michelle	Knapick	The Geraldine R. Dodge Foundation	X	
William	Koch	Great Swamp National Wildlife Refuge	X	X
Tony	Kramer	USDA - Natural Resources Conservation Service	X	
Cheryl	Maccaroni	NJDHSS Office of Animal Welfare	X	
Debbie	Mans	Office of the Governor	X	
Kerry	Miller	ANJEC	X	X
Mark	Murphy	Fund for New Jersey	X	
Vincent	Nichnadowicz	NJ DOT	X	X
Tom	Niederer	NJ Forestry Association	X	
Larry	Niles	ENSP	X	X
Margaret	O'Gorman	Conserve Wildlife Foundation	X	X
William	O’Hearn	Highlands Coalition - NJ Chapter	X	
Laurie	Pettigrew	DFW	X	X
Todd	Pover	ENSP	X	
Monica	Purcell	Department of Agriculture	X	
Sebastian	Reist	NJ Department of Agriculture	X	X
Jaclyn	Rhoads	Pinelands Preservation Alliance	X	
Sean	Robertson	Association of Fish and Wildlife Agencies	X	X
Paul	Scelsi	NJ DOT	X	X
Kris	Schantz	ENSP	X	X
Annette	Scherer	USFWS-Field Office	X	X
Howard	Schlegel	Cape May Refuge	X	X

APPENDIX B (continued)

First	Last	Organization	Invited	Attended
Tina	Schveda	Meadowlands Trust	X	X
Liz	Semple	NJDEP Office of planning and policy	X	
Bill	Sheehan	Hackensack Riverkeeper, Inc.	X	X
David	Smart	Natural Resources Conservation Service	X	X
Eileen	Swan	Office of Smart Growth	X	
Bob	Tudor	Delaware River Basin Commission	X	
Mick	Valent	ENSP	X	X
Maya	VanRossum	Delaware Riverkeepers	X	
Jim	Waltman	NJ Council of Watershed	X	
Jay	Watson	DEP, Deputy Commissioner	X	X
Kellie	Westervelt	Partnership for the Delaware Estuary	X	X
Jessica	Wilkinson	ELI	X	X
Nancy	Wittenberg	NJ Builders Assoc. Rep (Giordano Halleran & Ciesla)	X	
Joanna	Wolaver	New Jersey Audubon	X	X

APPENDIX C

State-Level Conservation Objectives Prioritization Results

The following state-level conservation goals have been selected as implementation priorities from the New Jersey Wildlife Action Plan. On Thursday, February 23, 2006 the First Wildlife Action Plan Stakeholder Meeting was held at Duke Farms in Hillsboro, New Jersey. The primary goal of the meeting was to solicit stakeholder input into prioritizing the top ten priority statewide conservation goals among the 63 listed in the New Jersey Wildlife Action Plan. The goals listed below reflect the input of stakeholders prior to and at the meeting. This final list of priority state-level goals has been edited slightly by ENSP staff to more accurately reflect the issues raised by stakeholders at the meeting. They are listed in order of the priority assigned by stakeholders.

Stakeholders stressed that the following four issues should be a critical component to meeting the top priority goals.

1. Public education and outreach should be an integral tool for meeting all of the priority goals;
2. Conservation efforts designed to meet these priority goals should include conservation strategies specific to urban and suburban areas;
3. Adaptive management techniques should be used to meet the priority goals. Monitoring will be critical to determining the appropriate adaptive management strategies; and
4. The priority goals are explicitly designed to address threats to all species of greatest conservation concern.

Ranking (1-10; 1=highest priority)	**Main Topic/Issue (may include combinations of issues)**	**Goal (may include combinations of goals)**
1	Addressing National, Inter-state, and Statewide Threats AND The Landscape Project	Identify and protect breeding, migration, wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.
2	Endangered, Threatened, and Rare Wildlife	Restore populations of endangered and threatened wildlife to stable levels that allow their delisting by population management, protecting critical habitat, and habitat restoration and enhancement.

APPENDIX C (continued)

3	Addressing National, Inter-state, and Statewide Threats	Identify, restore, and protect unique ecosystem processes including the control and/or removal of invasive and exotic species, fire management, and delayed and alternate patch mowing.
4	Migratory Stopover and Important Bird Areas Planning	Identify, monitor and conserve, key migratory corridors and stopover locations for migratory birds.
5	Addressing National, Inter-state, and Statewide Threats	Improve communication between farmers foresters and land stewards of private, local, state and federal lands to develop habitat management plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.
6	Addressing National, Inter-state, and Statewide Threats	Reduce the adverse impacts of non-native invasive species, subsidized predators, and over-abundant native species on critical wildlife, natural communities, and habitat quality.
7	Addressing National, Inter-state, and Statewide Threats	Identify, protect and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).
8	Addressing National, Inter-state, and Statewide Threats	Maintain connectivity of habitats at the landscape scale.
9	Addressing National, Inter-state, and Statewide Threats AND Long-Term Monitoring	Conduct long-term monitoring to evaluate population viability through statewide surveys, atlases, and effectiveness of protection and restoration efforts of both wildlife and their habitats.
10	Addressing National, Inter-state, and Statewide Threats	Identify, maintain, and restore natural vegetative communities through sustainable, area-specific deer densities.
11	Addressing National, Inter-state, and Statewide Threats	Restore and maintain wildlife populations by eliminating or reducing exposure to point and nonpoint source contamination.

APPENDIX C (continued)

12	Addressing National, Inter-state, and Statewide Threats	Identify and actively protect public natural lands and water with rare wildlife from ORV and personal watercraft use.
13	Review of Wildlife Action Plan	Ensure that conservation activities of federal, state, county, municipal, and private (NGOs) lands affecting species of conservation concern are consistent with the NJ WAP.

APPENDIX D

Wildlife Action Plan
2nd Stakeholders' Meeting
INSTRUCTIONS for PRIORITIZING CONSERVATION STRATEGIES

Please review the attached excel file. The following text provides background and context to aid your review.

For use at the second implementation meeting on April 6, 2006 to determine the priority state-level conservation strategies.

The excel file called State Level Strategies Review contains the thirteen (13) priority state-level conservation **goals** (A-M) selected during the Wildlife Action Plan's first implementation meeting on February 23, 2006. In addition, we have included the state-level conservation **strategies** associated with each of the goals.

In **BLUE text,** you will find the Endangered and Nongame Species Program's (ENSP) priority selections. *(For those of you without color printers, we have also commented that the strategy is an "ENSP Priority.")* These strategies have been revised from their original text to include measurable outcomes and where goals have been revised or combined (per the first implementation meeting), strategies have been refined to better suit the revised goal(s).

In **BLACK text** are strategies the ENSP did not select as priority, however, we ask that you review them as well to determine if you think a strategy SHOULD be considered a priority.

Please keep in mind that: 1) Strategies in black text have NOT been revised and therefore, may seem inappropriate for the revised or combined goal(s). In such cases, we ask that you use the given strategies (and where goals have been combined, use the "sub-topic" such as "Landscape Project" or "Development") as guides to develop more appropriate strategies for those you wish to include as priorities. 2) ALL strategies selected as priorities MUST be revised/ refined to include measurable outcomes.

APPENDIX D

Wildlife Action Plan: Implementation Prioritization - Conservation Strategies

See accompanying Microsoft Word file "Instructions - Wildlife Action Plan - Imp Mtg 2" for instructions regarding this document.

Goals (A-M)	Strategy Number	Conservation Strategy	Comments
A.	**Identify and protect breeding, migration, wintering habitats and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.**		
	A-1	DFW will lead in the training of municipal and county planners to use the Landscape Map to identify critical wildlife habitats for sensitive species and natural systems within their borders.	*ENSP PRIORITY; Addresses Goals A and H*
	A-2	Increase the number of data sources to populate the Biotics database and work to improve data quality and to decrease the time necessary to review and input the data.	*ENSP PRIORITY*
	A-3	Use Landscape Project Mapping to create products that guide land management, habitat conservation, restoration, land acquisition and land planning at all levels of government and non-government organizations.	*ENSP PRIORITY*
	A-4	Mitigate impacts of existing development, particularly adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).	*ENSP PRIORITY; Addresses Goals A and H*
	A-5	Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.	*ENSP PRIORITY*
	A-6	Refine Landscape Project Mapping by improving existing models and creating new models that define habitats for those species lacking models.	*ENSP PRIORITY*
	A-7	DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 10 years in order to benefit wildlife, habitat and the quality of life for New Jersey citizens.	*Drawn from the "Suburban Sprawl and Large-acre zoning" section*

APPENDIX D (continued)

	Strategy Number	Conservation Strategy	Comments
	A-8	County and municipal planners should collaborate in developing master planning documents and ordinances that consider the larger region as a precursor to Habitat Conservation Plans.	*Drawn from the "Suburban Sprawl and Large-acre zoning" section*
	A-9	Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat.	*Drawn from the "Suburban Sprawl and Large-acre zoning" section*
	A-10	Establish growth areas within a locality and provide incentives for development within those designated areas while discouraging development outside of those areas.	*Drawn from the "Suburban Sprawl and Large-acre zoning" section*
	A-11	Encourage towns to work together to achieve sustainable development. Avoid large-acre zoning as the only mechanism for limiting development due to its unintended consequences: remains of irreparably fragmented habitats.	*Drawn from the "Suburban Sprawl and Large-acre zoning" section*
	A-12	Decrease isolation of public natural lands by development.	*Drawn from the "Development" section*
	A-13	Use the Landscape Map to identify areas of important habitat to focus backyard habitat programs such as the stopover project (NJ Division of Fish and Wildlife), certified backyard habitat (National Wildlife Federation), and backyard habitat with native plants (NJ Audubon Society).	*Drawn from the "Development" section*
	A-14	Assist landowners interested in habitat enhancement programs by providing technical assistance through the NJ Habitat Incentive Team (NJ HIT) for landowners interested in habitat enhancement programs. Landowners will receive guidance on the program best suited for their individual needs and their habitat within the context of the regional landscape.	*Drawn from the "Development" section*
	A-15	Secure state funding for the Division of Fish and Wildlife's Environmental Review Office to allow continued review of stream cleaning and stream encroachment permit applications.	*Drawn from the "Development" section*
	A-16	Enforce existing regulations to prevent illegal stream cleaning or snag removal activities.	*Drawn from the "Development" section*
	A-17	Where appropriate, install fish ladders to assist passage of anadromous fish in areas with dams; monitor passage as necessary.	*Drawn from the "Development" section*

	Strategy Number	Conservation Strategy	Comments
	A-18	Build models that define habitats for those species lacking models. Refine existing models based on new information.	*Drawn from the "Landscape Project" section*
	A-19	Develop site-based management plans using the Landscape Project and principles of landscape ecology as foundation.	*Drawn from the "Landscape Project" section*
	A-20	Cross-walk existing site-based plans for National Wildlife Refuges, military bases, and other public lands against the Wildlife Action Plan and make appropriate changes.	*Drawn from the "Landscape Project" section*
	A-21	Use designation of special resource areas under the New Jersey State Development and Redevelopment plan and other protective planning such as marine protected areas to recognize and afford protection to landscapes of critical importance to conserving regional biodiversity.	*Drawn from the "Landscape Project" section*
B.	**Restore populations of endangered and threatened wildlife to stable levels that allow their delisting by population management, protecting critical habitat, and habitat restoration and enhancement.**		
	B-1	Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable functioning ecosystems.	*ENSP PRIORITY*
	B-2	22. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.	*ENSP PRIORITY*
	B-3	29. Conduct surveys to identify migratory corridors for bats, marine mammals and anadromous fish.	*ENSP PRIORITY*
	B-4	28. Continue to develop and improve habitat creation and restoration technologies.	

Goal	Strategy Number	Conservation Strategy	Comments
C.	**Identify, restore, and protect unique ecosystem processes including the control and/or removal of invasive and exotic species, fire management, and delayed and alternate patch mowing.**		
	C-1	Reduce regulatory impediments to restoration and enhancement activities.	*ENSP PRIORITY*
	C-2	Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.	*ENSP PRIORITY*
	C-3	Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.	*ENSP PRIORITY*
	C-4	Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.	*ENSP PRIORITY*
	C-5	Reduce the area of phragmites in coastal wetlands by restoring natural tidal flow.	*ENSP PRIORITY*
	C-6	Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.	*ENSP PRIORITY*
	C-7	Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by the Landscape Project map.	*ENSP PRIORITY*
	C-8	Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.	*ENSP PRIORITY*
D.	**Identify, monitor and conserve, key migratory corridors and stopover locations for migratory birds.**		
	D-1	Conduct surveys of migrating passerines and raptors at major stopover areas along the Cape May Peninsula every five years.	*ENSP PRIORITY*
	D-2	Annually monitor shorebird populations along the Delaware Bayshore stopover.	*ENSP PRIORITY*

	Strategy Number	Conservation Strategy	Comments
	D-3	Prioritize land acquisition and develop management strategies to conserve stopover habitat.	*ENSP PRIORITY*
	D-4	Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.	*ENSP PRIORITY*
	D-5	Conduct studies and create models to identify migratory bird routes and assess the potential avian risks of wind turbines, tall buildings, radio towers and other "human-made" tall structures.	*ENSP PRIORITY*
	D-6	Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.	
	D-7	Develop plans to improve and preserve existing habitat.	
	D-8	Raise public awareness about the value of habitat for birds and other wildlife.	
	D-9	Conduct the annual Mid-Winter Waterfowl Survey and the Atlantic Flyway Breeding Waterfowl Survey.	
E.	**Encourage farmers, foresters and land stewards of private, local, state and federal lands to develop habitat management plans that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.**		
	E-1	Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for land owners enrolling in Landowner Incentive Programs.	*ENSP PRIORITY*
	E-2	Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood (July 15th); leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.	*ENSP PRIORITY*
	E-3	Develop BMPs or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, etc.	*ENSP PRIORITY*

	Strategy Number	Conservation Strategy	Comments
	E-4	Increase the number of Category 1 streams justified by E&T species data.	*ENSP PRIORITY*
	E-5	Provide technical assistance and incentives through NJ HIT to minimize impacts of fertilizers, pesticides, livestock, etc., on waterways by maintaining adequate buffers and, when feasible, enhancing riparian areas through stream bank restoration efforts.	
F.	**Reduce the adverse impacts of non-native invasive species, subsidized predators, and over-abundant native species on critical wildlife, natural communities, and habitat quality.**		
	F-1	Create aggressive outreach programs for targeted groups (e.g. landscape designers, waterwatch groups, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.	*ENSP PRIORITY*
	F-2	Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.	*ENSP PRIORITY*
	F-3	Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownerhip and care through public service announcements, brochures, public presentations, etc.	*ENSP PRIORITY*
	F-4	Develop BMP guidelines and a model municipal TNR ordinance that together ensure that managers can effectively manage feral cats, including cat colonies, that pose a risk to vulnerable native wildlife (e.g., beach-nesting bird colonies, areas supporting ground-nesting birds).	*ENSP PRIORITY*
	F-5	Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.	*ENSP PRIORITY*
	F-6	Create and implement a system for reporting and qualifying new locations of priority invasive species.	*ENSP PRIORITY*
	F-7	Conduct research to develop better information on the impacts of feral and free-roaming cats on native wildlife populations.	*ENSP PRIORITY*

	Strategy Number	Conservation Strategy	Comments
	F-8	Create implementation plan for Invasive Species Task Force recommendations when completed.	*ENSP PRIORITY*
	F-9	Concurrently, efforts focusing specifically on identifying and mapping infestations should be conducted as funding permits.	*Drawn from the "Invasive Terrestrial and Aquatic Species and Exotic Pathogens" section*
	F-10	Establish coordinated and consistent priorities based upon an evaluation of the aggressiveness of the infestations, ecological importance of the community or habitat affected, and likelihood of success. Utilize expert guidance on control methods and develop efficient approaches through expert consensus.	*Drawn from the "Invasive Terrestrial and Aquatic Species and Exotic Pathogens" section*
	F-11	Prevent new infestations of invasive species by maintaining communication with agencies and conservation organizations in New Jersey and surrounding states to ensure that interstate sightings of exotic freshwater fish species, mollusks, aggressive pathogens, and insects are known and documented.	
	F-12	Provide educational materials at all public and non-government organization natural land areas.	*Drawn from the "Subsidized Predators" section*
	F-13	Develop and implement management practices to reduce predation on native wildlife such as predator exclosures and electric fences.	*Drawn from the "Subsidized Predators" section*
	F-14	Work with local municipalities to develop policies and/or establish regulations that minimize the impacts of predators on native wildlife species, including bans on "managed" cat colonies and feeding of wildlife near critical wildlife areas.	*Drawn from the "Subsidized Predators" section*
G.	**Identify, protect and minimize human disturbance at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).**		
	G-1	Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.	*ENSP PRIORITY*

	Strategy Number	Conservation Strategy	Comments
	G-2	Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, Pine snake nesting areas, timber rattlesnake dens and gestation sites, and bat hibernacula.	*ENSP PRIORITY*
	G-3	Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.	*ENSP PRIORITY*
	G-4	Investigate impacts of controlled water releases on aquatic organisms (e.g. freshwater mussels) through current and future research.	
	G-5	Investigate reports of illegal draw-downs and enforce existing regulations.	
	G-6	Continue to review such data as biological assessments from existing power plants and provide recommendations to minimize impingement/entrainment impacts.	
	G-7	Develop statewide outreach programs to educate citizens about New Jersey's ecosystems, natural communities, and state laws and restrictions.	
	G-8	Develop responsible ecotourism opportunities to foster appreciation for New Jersey's biological diversity and greater understanding of the economic benefits of wildlife.	
H.	**Maintain connectivity of habitats at the landscape scale.**		
	H-1	Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands.	*ENSP PRIORITY*
	H-2	DEP will create a staff within DEP to provide technical support to New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 10 years in order to benefit wildlife, habitat and the quality of life for New Jersey citizens.	*ENSP PRIORITY*

	Strategy Number	Conservation Strategy	Comments
	H-3	Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.	*ENSP PRIORITY*
	H-4	Encourage towns to work together to achieve sustainable development. Avoid large-acre zoning as the only mechanism for limiting development due to its unintended consequences: remains of irreparably fragmented habitats.	
I.	**Conduct long-term monitoring to evaluate population viability through statewide surveys, atlases, and effectiveness of protection and restoration efforts of both wildlife and their habitats.**		
	I-1	Maintain monitoring programs that collect data on species, suites of species and habitats statewide, including but not limited to the following: o Breeding Bird Atlas o Breeding Bird Survey o Delaware Bay Migratory Shorebird Survey o Bald Eagle Midwinter Survey o Herptile Atlas o Calling Amphibian Monitoring Program o Fish Monitoring-Streams and Ponds o Freshwater Mussel Atlas o Mid-Winter Waterfowl Survey o Atlantic Flyway Breeding Waterfowl Survey o DFW Bobwhite Call-Count Survey o Woodcock Call-Count Survey o DFW Beaver-Otter Survey o Migratory Game Bird Banding Programs	*ENSP PRIORITY*
	I-2	Complete the Coordinated Bird Monitoring Plan to increase efficiency and effectiveness of bird surveys.	*ENSP PRIORITY*
	I-3	Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.	*ENSP PRIORITY*

	Strategy Number	Conservation Strategy	Comments
	I-4	Measure the enrollment acreage and effectiveness of backyard habitat mgmt.	*ENSP PRIORITY*
	I-5	Track the acreage and management of land enrolled in habitat enhancement programs administed by NJ HIT; monitoring each site and evaluate effectiveness of management technique.	*ENSP PRIORITY*
	I-6	Decrease isolation of public natural lands by development.	*Drawn from the "Development" section*
	I-7	Secure state funding for the Division of Fish and Wildlife's Environmental Review Office to allow continued review of stream cleaning and stream encroachment permit applications.	*Drawn from the "Development" section*
	I-8	Enforce existing regulations to prevent illegal stream cleaning or snag removal activities.	*Drawn from the "Development" section*
	I-9	Where appropriate, install fish ladders to assist passage of anadromous fish in areas with dams; monitor passage as necessary.	*Drawn from the "Development" section*
J.	**Identify, maintain, and restore natural vegetative communities through sustainable, area-specific deer densities.**		
	J-1	Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks in Skylands, Delaware Bay, and Pinelands Landscape Regions.	*ENSP PRIORITY*
	J-2	Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting and Sunday bow hunting.	*ENSP PRIORITY*
	J-3	Institute measures to require addressing deer management in plans developed by the US Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) for any farm property that receives state or federal funding. The plans must include harvest quotas and mechanisms to insure implementation.	*ENSP PRIORITY*

	Strategy Number	Conservation Strategy	Comments
	J-4	Fully fund the Hunters Helping the Hungryvenison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted becuase they have no need of or an outlet for the venizon. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefor help meet harvest quotas.	*ENSP PRIORITY*
	J-5	Work with private landowners and municipalities to control deer via volunteer hunters working in cooperation with the DFW on specialized controlled hunts that meet the needs of various property owners.	
	J-6	Develop and implement, through regulation or legislation, programs that require farmers to achieve deer management goals, including harvest quotas, in order to obtain farm tax assessment or to qualify for farmland preservation programs.	
	J-7	Continue research into contraceptive approaches to reducing deer populations.	
K.	**Restore and maintain wildlife populations by eliminating or reducing exposure to point and nonpoint source contamination.**		
	K-1	Reduce contaminants of concern (eg., PCBs, DDT, mercury) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.	*ENSP PRIORITY*
	K-2	Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures.	*ENSP PRIORITY*
	K-3	Expand efforts with DEP's Division of Water Quality to analyze and attempt to minimize contaminants in the water.	

	Strategy Number	Conservation Strategy	Comments
	K-4	Analyze tissues of actual or typical prey items and the environment of nest areas for contaminants to assess the level of contaminants and determine the threat within the food web.	
	K-5	Work with state and federal hazardous site cleanup programs to reduce exposures to contaminants.	
L.	**Identify and actively protect public natural lands and water with rare wildlife from ORV and personal watercraft use.**		
	L-1	Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas.	*ENSP PRIORITY*
	L-2	Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality or disturbance.	*ENSP PRIORITY*
	L-3	Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.	*ENSP PRIORITY*
	L-4	Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.	*ENSP PRIORITY*
	L-5	Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles.	
	L-6	Develop new methods to minimize the impact of personal watercraft on breeding, roosting and migratory avian species.	

Goal	Strategy Number	Conservation Strategy	Comments
M.	Ensure that conservation activities of federal, state, county, municipal, and private (NGOs) lands affecting species of conservation concern are consistent with the NJ WAP.		
	M-1	The most current version of the WAP will be continually available for review on the DFW Website with an open invitation to submit comments.	*ENSP PRIORITY*
	M-2	Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the WAP beginning with Division and Department biologists in a process that includes DEP staff, the Advisory Committee, and a wildlife summit in which adaptive managment will be built into the revision.	*ENSP PRIORITY*
	M-3	DFW will work with state and federal land managers to incorporate the goals and strategies of the NJ WAP into current management plans by the first formal review in 2011.	*ENSP PRIORITY*
	M-4	Dedicate one meeting of the Endangered and Nongame Species Advisory Committee (ENSAC) per year to reviewing the progress and soliciting input on the WAP.	*ENSP PRIORITY*
	M-5	Each revised WAP will be linked to the most current Landscape Project mapping and made available for interactive use.	
	M-6	Each revised WAP will include a revised listing of species of conservation concern, referencing the state lists of endangered, threatened and special concern wildlife, and those species recognized as high priority by regional conservation plans.	

APPENDIX E

New Jersey Wildlife Action Plan
Priority State-level Goals and Strategies

Below you will find thirteen priority state-level goals identified at the First Wildlife Action Plan Stakeholder Meeting held on February 23, 2006, and the associated priority conservation strategies identified at the Second Wildlife Action Plan Stakeholder Meeting held on April 6, 2006. The goals have been categorized by the main topic and, where appropriate, the sub-topic as identified within the New Jersey Wildlife Action Plan. The goals and associated priorities have been arranged in categories and key words and concepts appear in bold to provide focus for the array of New Jersey partners in conservation, land managers and stewards, outreach initiatives, and residents interested in managing their lands to support native wildlife.

All of the goals and strategies have integrated public education and outreach and are to be implemented with an active adapted management strategy. The New Jersey Division of Fish and Wildlife hopes to receive continual feedback on implementation successes and failures that our state can integrate into the Wildlife Action Plan and implementation process.

Addressing National, Inter-state, and Statewide Threats

Suburban sprawl and large-acre zoning

Goal: Identify and **protect** breeding, migration, wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.

1. NJ Division of Fish and Wildlife (DFW) will lead in the training of municipal and county planners to use the Landscape Map to identify critical wildlife habitats for sensitive species and natural systems within their borders.
2. Increase the number of data sources to populate the Biotics database and work to improve data quality and to decrease the time necessary to review and input the data.
3. Use Landscape Project Mapping to create products that guide land management, habitat conservation, restoration, land acquisition and land planning at all levels of government and non-government organizations.
4. Mitigate impacts of existing development, particularly adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
5. Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
6. Refine Landscape Project Mapping by improving existing models as new information (on habitat typing and species requirements) becomes available, and creating new models that more accurately define habitats for those species lacking models.
7. DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances

that consider the larger landscape region. Various methods to achieve this include clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.

8. Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
9. Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.

Goal: Maintain **connectivity of habitats** at the landscape scale.

1. Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
2. DEP will create a staff within DEP to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
3. Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
4. Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

Goal: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.

1. Reduce regulatory impediments to restoration and enhancement activities.
2. Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
3. Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
4. Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
5. Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
6. Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.

7. Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by the Landscape Project map.
8. Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
9. Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.

Goal: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.

1. Create aggressive outreach programs for targeted groups (e.g. landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
2. Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
3. Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
4. Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:.
    a. A model ordinance for municipalities that elect to implement or allow TNR to attempt to reduce feral cat populations.
    b. A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    c. A model ordinance for regulating feeding of wildlife.
    d. A model pet licensing ordinance.
5. Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
6. Create and implement a system for reporting and qualifying new locations of priority invasive species.
7. Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
8. Create implementation plan for Invasive Species Task Force recommendations when completed.

Unsustainable Land Management Practices on both Private and Conserved Lands and Water

Goal: Encourage farmers, foresters and land stewards of private, local, state and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

1. Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
2. Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
3. Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
4. Increase the number of Category 1 streams justified by E&T species data.
5. Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using the Landscape Project and principles of landscape ecology as foundation.

Direct Human Impacts on Native Wildlife and Ecosystem Health

Goal: Identify, protect and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

1. Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
2. Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, and bat hibernacula.
3. Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
4. Investigate impacts of controlled water releases on aquatic organisms (e.g. freshwater mussels) through current and future research.

Development and Long-term Monitoring

Goal: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases; and the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.

1. Maintain monitoring programs that collect data on species, suites of species and habitats statewide, including but not limited to the following:
   - o Breeding Bird Atlas
   - o Breeding Bird Survey
   - o Delaware Bay Migratory Shorebird Survey
   - o Bald Eagle Midwinter Survey
   - o Herptile Atlas
   - o Calling Amphibian Monitoring Program
   - o Fish Monitoring-Streams and Ponds
   - o Freshwater Mussel Atlas
   - o Mid-Winter Waterfowl Survey
   - o Atlantic Flyway Breeding Waterfowl Survey
   - o DFW Bobwhite Call-Count Survey
   - o Woodcock Call-Count Survey
   - o DFW Beaver-Otter Survey
   - o Migratory Game Bird Banding Programs
   - o Colonial Waterbird Survey
   - o Beach Nesting Bird Survey
   - o Site-specific Fish Monitoring Programs
2. Complete the Coordinated Bird Monitoring Plan to increase efficiency and effectiveness of regional and national bird surveys.
3. Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
4. Measure the enrollment acreage and effectiveness of backyard habitat mgmt.
5. Track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitoring each site and evaluate effectiveness of management technique.
6. Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; colon prioritize by waterways with fish species of conservation concern.

High Deer Densities

Goal: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific deer densities**.

1. Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
2. Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting, Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.

3. Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
4. Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.
5. Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
6. Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment should be required to achieve deer management goals, including harvest quotas, in order to obtain farm tax assessment or to qualify for farmland preservation programs.

Contaminants

Goal: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination**.

1. Reduce contaminants of concern (e.g.. PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
2. Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas for contaminants to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
3. Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies) and 3) post restoration/clean-up effects on wildlife populations.

Motorized Recreation Vehicles

Goal: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use**.

1. Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.

2. Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
3. Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
4. Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
5. Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.

Endangered, Threatened and Rare Wildlife

Goal: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protecting critical habitat, and habitat restoration and enhancement.

1. Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable functioning ecosystems.
2. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
3. Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, lepidoptera, and odonata.

Migratory Stopover and Important Bird Areas Planning

Goal: Identify, monitor and **conserve, key migratory corridors and stopover locations** for migratory birds.

1. Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
2. Annually monitor shorebird populations along the Delaware Bayshore stopover.
3. Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.
4. Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
5. Conduct studies and create models to identify migratory bird routes and assess the potential avian risks of wind turbines, tall buildings, radio towers and other "human-made" tall structures.

6. Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.

Review of Wildlife Action Plan

Goal: Ensure that conservation activities of federal, state, county, municipal, and private (non-government organizations') lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan.

1. The most current version of the WAP will be continually available for review on the DFW Website with an open invitation to submit comments.
2. Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the WAP beginning with Division and Department biologists in a process that includes DEP staff, the Advisory Committee, and a wildlife summit in which adaptive management will be built into the revision.
3. DFW will work with federal, state, county, municipal, and private (NGOs) land managers to incorporate the goals and strategies of the NJ WAP into current management plans by the first formal review in 2011.
4. Dedicate one meeting per year to reviewing the progress and soliciting input on the WAP, participants to include representatives of the Endangered and Nongame Species Advisory Committee (ENSAC), the Fish and Game Council and the Marine Fisheries Council.

Attachment D: Summary of State-level Conservation Objectives and Strategies Meeting

New Jersey Wildlife Action Plan
Priority State-level Goals and Strategies

Below you will find thirteen priority state-level goals identified at the First Wildlife Action Plan Stakeholder Meeting held on February 23, 2006, and the associated priority conservation strategies identified at the Second Wildlife Action Plan Stakeholder Meeting held on April 6, 2006. The goals have been categorized by the main topic and, where appropriate, the sub-topic as identified within the New Jersey Wildlife Action Plan. The goals and associated priorities have been arranged in categories and key words and concepts appear in bold to provide focus for the array of New Jersey partners in conservation, land managers and stewards, outreach initiatives, and residents interested in managing their lands to support native wildlife.

All of the goals and strategies have integrated public education and outreach and are to be implemented with an active adapted management strategy. The New Jersey Division of Fish and Wildlife hopes to receive continual feedback on implementation successes and failures that our state can integrate into the Wildlife Action Plan and implementation process.

Addressing National, Interstate, and Statewide Threats

Suburban sprawl and large-acre zoning

Goal: Identify and **protect** breeding, migration, and wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.

1. NJ Division of Fish and Wildlife (DFW) will collaborate with municipal and county planners to identify critical wildlife habitats for sensitive species and natural systems within their borders.
2. Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.
3. Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition, and land planning at all levels of government and non-government organizations.
4. Mitigate impacts of existing development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
5. Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
6. Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available.
7. DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include

clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.

8. Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
9. Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.

Goal: Maintain **connectivity of habitats** at the landscape scale.

1. Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
2. DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
3. Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
4. Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

Goal: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.

1. Reduce regulatory impediments to restoration and enhancement activities.
2. Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
3. Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
4. Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
5. Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
6. Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.
7. Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by GIS analysis.

8. Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
9. Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.

Goal: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.

1. Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
2. Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
3. Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
4. Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies, and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:.
    a. A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations.
    b. A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    c. A model ordinance for regulating feeding of wildlife.
    d. A model pet licensing ordinance.
    e. Mapping of colonies to evaluate impact on species of conservation concern.
5. Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
6. Create and implement a system for reporting and qualifying new locations of priority invasive species.
7. Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
8. Create implementation plan for Invasive Species Task Force recommendations when completed.

Unsustainable Land Management Practices on both Private and Conserved Lands and Water

Goal: Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

1. Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
2. Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
3. Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
4. Through surveys, increase the number of Category 1 streams justified by endangered and threatened species data.
5. Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using GIS and principles of landscape ecology as the foundation.

Direct Human Impacts on Native Wildlife and Ecosystem Health

Goal: Identify, protect, and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

1. Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
2. Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
3. Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
4. Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.

Development and Long-term Monitoring

Goal: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases to determine the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.

1. Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following:
   o Breeding Bird Atlas

- o Breeding Bird Survey
- o Delaware Bay Migratory Shorebird Survey
- o Bald Eagle Midwinter Survey
- o Herptile Atlas
- o Calling Amphibian Monitoring Program
- o Fish Monitoring-Streams and Ponds
- o Freshwater Mussel Atlas
- o Mid-Winter Waterfowl Survey
- o Atlantic Flyway Breeding Waterfowl Survey
- o DFW Bobwhite Call-Count Survey
- o Woodcock Call-Count Survey
- o DFW Beaver-Otter Survey
- o Migratory Game Bird Banding Programs
- o Colonial Waterbird Survey
- o Beach Nesting Bird Survey
- o Site-specific Fish Monitoring Programs

2. Complete the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.
3. Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
4. Measure the enrollment acreage and effectiveness of backyard habitat management.
5. Through GIS, track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitor each site and evaluate the effectiveness of the management technique.
6. Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.

High Deer Densities

Goal: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific deer densities**.

1. Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
2. Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting, Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.
3. Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
4. Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.

5. Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
6. Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.

Contaminants

Goal: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination**.

1. Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
2. Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
3. Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

Motorized Recreation Vehicles

Goal: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use**.

1. Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.
2. Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
3. Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
4. Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
5. Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles.

Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.

Endangered, Threatened and Rare Wildlife

Goal: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protection of critical habitat, and habitat restoration and enhancement.

1. Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
2. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
3. Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.

Migratory Stopover and Important Bird Areas Planning

Goal: Identify, monitor, and **conserve key migratory corridors and stopover locations** for migratory birds.

1. Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
2. Annually monitor shorebird populations along the Delaware Bayshore stopover.
3. Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.
4. Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
5. Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers, and other "human-made" tall structures.
6. Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.

Review of Wildlife Action Plan

Goal: Ensure that **conservation activities** of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan (Plan).

1. The most current version of the Plan will be continually available for review on the Division of Fish and Wildlife's Web site with an open invitation to submit comments.
2. Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the Endangered and Nongame Species Advisory Committee (ENSAC), and a wildlife summit in which adaptive management will be built into the revision.

3. DFW will work with federal, state, county, municipal, and private (NGOs) land managers to incorporate the goals and strategies of the Plan into current management plans by the first formal review in 2011.
4. Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the ENSAC, the Fish and Game Council, and the Marine Fisheries Council.

Attachment E: Booklet of Priority State-level Conservation Goals and Strategies

It is important to note that the following booklet was prepared in a format for professional printing. Therefore, a standard printer will result in pages that are out of order. Please be sure to refer to page numbers when collating a printed version.

Global Climate Change…everyone's concern

Threats to our planet, such as global warming and reduced air and water quality, continue to jeopardize the future of our natural systems and quality of life in New Jersey. Global climate changes **will** affect our wildlife, their habitats, and our citizens' quality of life…at this point it is simply a matter of time. Some of these effects include:

- Increase in the frequency and intensity of flooding within our state.
- Changes in New Jersey's coastline.
- Declining air quality.
- Local or global extinction of rare species and coldwater fish, which are sensitive to environmental changes and increased temperatures.
- Declines in amphibians and waterfowl related to coastal and inland waters.
- Changes in bird migration schedules, insect emergence, and fruit/ seed availability that may result in a lack of food resources for NJ's migrating birds.

Stakeholders and partners attending the Wildlife Action Plan Implementation meetings held on February 23 and April 6, 2006, recognized global warming and air quality as very important issues. However, the consensus was that the magnitude of these threats is too great for one state to address effectively. NJ's partners in conservation did acknowledge that in order to determine the effects of global warming on our wildlife and their habitats, long-term research and monitoring efforts would be required. Therefore future research will include the collection of data that may help to document changes and increase our understanding of global warming threats. These threats may include changes such as increased water temperatures, rising sea level, detrimental changes in vegetation composition, decreasing food resource availability (e.g., insects), disadvantageous changes in bird migration routes and timing, and the appearance and disappearance of climate sensitive species.

The NJ Department of Environmental Protection (DEP) has been recognized as a national leader in protecting the state's environment and natural resources through progressive, innovative regulation and strict enforcement. This will ultimately result in improved water and habitat quality that support sensitive species and our own quality of life in NJ.

New Jersey, in cooperation with other Mid-Atlantic and Northeastern states, is a member of the Regional Greenhouse Gas Initiative (RGGI), **www.RGGI.org.** RGGI is developing a regional strategy for controlling greenhouse gas emissions. However, there is still much work to do and our public officials need to be informed that this issue IS a priority for the citizens of NJ and our nation.

To learn more about global climate change and what you can do to help, please visit:

The National Wildlife Federation:
www.targetglobalwarming.org/new/files/NewJersey_GlobalWarmingFactSheet.pdf

The Climate Action Plan: A Plan to Save Energy and Reduce Greenhouse Gas Emissions developed by the Burlington Climate Protection Task Force in Burlington, Vermont, 2000, page 7:
www.burlingtonelectric.com/SpecialTopics/Household.pdf

New Jersey's Wildlife Action Plan
Creating a Network for Conservation

New Jersey is home to diverse and fascinating populations of wildlife. From the Delaware Bay to the Highlands, from the Pinelands to the shore, and from the greenways that parallel our highways to the bridges that span our rivers, wildlife lives and breeds in, and migrates through, the Garden State.

New Jersey's wildlife and the places that host them are under threat. As development increases fragmentation, invasive plants alter the landscape, and people continue to impact natural systems. As a result, the populations of birds, insects, fish, snakes, turtles, and bats and other mammals that live in our state find themselves clinging to smaller and smaller pieces of wild, clean lands. These lands are not used just by wildlife but by many of the state's residents for hiking, hunting, biking, and fishing.

To enumerate and address the pressures on our wildlife, New Jersey has, as part of an innovative national effort, developed a state Wildlife Action Plan (Plan). The Plan seeks to list the threats to wildlife and the actions we can all take to address them.

Written by staff at the Division of Fish and Wildlife, other state and federal agencies, and many partners in conservation, the Plan is not just for biologists and wildlife experts. It is for municipal leaders, land stewards, non-profit organizations, educators, planners, researchers, outdoor recreation enthusiasts, and all the people who know the wild places of our state and realize that a healthy biodiversity is another good reason to live and play in New Jersey.

This document is a snapshot of New Jersey's Wildlife Action Plan, listing a selection of priority conservation goals from the full Plan and a selection of conservation strategies (actions) that could be used to achieve these goals in the tables on pages 17 - 23. From this list, we have highlighted some of the strategies (pages 4 –16) and revised the wording for a more general audience. The priority goals and strategies were chosen over two meetings held in late winter/early spring of 2006 with input from nearly 100 individuals representing groups with an interest in New Jersey's wildlife. For the complete list of state-level goals and strategies, please visit the NJ Wildlife Action Plan: **www.njfishandwildlife.com/ensp/waphome.htm**

Acknowledgments

The NJ Wildlife Action Plan is a blueprint for the future conservation of our state's species of greatest conservation need. The Plan was developed through multiple stages, but began with the assistance of a contract planner, Gideon Lachman. We thank Gideon for helping us get the ball rolling and acknowledge the staff of the Endangered and Nongame Species Program (ENSP) within the Department of the Environmental Protection's Division of Fish and Wildlife and the scientific and technical staff of the Conserve Wildlife Foundation (CWF) whose dedicated work over many months shaped the Plan. ENSP and CWF staff include David Jenkins, Acting Chief, Kris Schantz, Kathy Clark, Michael Valent, Amanda Dey, David Golden, Jeanette Bowers-Altman, Naomi Avissar, Melissa Craddock, Michael Davenport, Gretchen Fowles, MacKenzie Hall, Brian Henderson, Chris Kisiel, Kim Korth, Sharon (DeFalco) Petzinger, Todd Pover, Larissa Smith, Peter Winkler, Patrick Woerner, Brian Zarate, Terry Terry, and Linda Watson. Numerous programs and staff from the Department of Environmental Protection and the various Bureaus within the Division of Fish and Wildlife provided valuable review and input. Special thanks to Director David Chanda and James Sciascia, Chief of the Bureau of Information and Education, for their continued support and assistance during the development and review of the Plan. We also appreciate significant input from Deputy Commissioner John Watson, as well as the Director of the Division of Policy and Planning, Jeanne Herb, and Marjorie Kaplan; and for continued support from Commissioner Lisa Jackson and Assistant Commissioner Amy Cradic as we begin implementing the Plan statewide.

A special debt of gratitude is owed to the New Jersey Endangered and Nongame Species Advisory Committee, chaired by Jane Morton Galetto. Their expertise and guidance over the years and during the development of the Plan have helped New Jersey become a national leader in rare species conservation. The NJ Fish and Game Council also provided input.

We are also grateful to the Conserve Wildlife Foundation of New Jersey for their support of this project and thank Executive Director Margaret O'Gorman and staff, Patricia Shapella, Pola Galie, and Maria Dubois-Grace for assistance in reviewing, editing, and pursuing implementation of the Plan. Special thanks to Kevin Frey for his assistance in reviewing and editing this brochure. Other agencies and New Jersey conservation organizations that were major contributors to the Plan through the development and the review process that deserve special

Topic & Goal No.	Priority State-level Conservation Goals and Strategies as written within the NJ Wildlife Action Plan, February 16, 2007
Addressing National, Interstate, and Statewide Threats	
Goal 12: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use.**	
*	Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.
*	Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
*	Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.
*	Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
	Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
Review of Wildlife Action Plan	
Goal 13: Ensure that conservation activities of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan.	
*	The most current version of the Plan will be continually available for review on the Division of Fish and Wildlife's Web site with an open invitation to submit comments.
*	Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the ENSAC, and a wildlife summit in which adaptive management will be built into the revision.
*	DFW will work with federal, state, county, municipal, and private land managers to incorporate the goals and strategies of the Plan into current management plans by the first formal review in 2011.
*	Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the Endangered and Nongame Species Advisory Committee (ENSAC), the Fish and Game Council, and the Marine Fisheries Council.

Topic & Goal No.	Priority State-level Conservation Goals and Strategies as written within the NJ Wildlife Action Plan, February 16, 2007
(continued) Addressing National, Interstate, and Statewide Threats	
*	Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
*	Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies, and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including: a. A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations. b. A guidance document/protocol for minimizing the impacts of TNR on native wildlife. c. A model ordinance for regulating feeding of wildlife. d. A model pet-licensing ordinance.
*	Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
*	Create and implement a system for reporting and qualifying new locations of priority invasive species.
	Develop species- and habitat-specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
	Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
	Create implementation plan for Invasive Species Task Force recommendations when completed.
Addressing National, Interstate, and Statewide Threats	
Goal 11: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination.**	
*	Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
*	Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
	Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

recognition include NJ Audubon Society, NJ Conservation Foundation, The Nature Conservancy-NJ Chapter, NJ Future, the Pinelands Commission, D&R Greenway Land Trust, the US Fish and Wildlife Service-NJ Field Office, National Wildlife Refuges (NWR), especially the Edwin B. Forsythe NWR, Cape May NWR, Supawna Meadows NWR, Great Swamp NWR, Wallkill River NWR, the National Park Service (Gateway National Recreation Area-Sandy Hook Unit and Delaware Water Gap National Recreation Area-Millbrook), US Department of Defense, and USDA Natural Resource Conservation Service (NRCS).

A special thank you to the Environmental Law Institute and NJ Future for helping us organize the Wildlife Summit and to the representatives of over 60 federal, state, county, and private agencies and organizations who attended and participated to foster discussion and provide recommendations regarding New Jersey wildlife conservation issues. Duke Farms Foundation and the Doris Duke Charitable Foundation graciously hosted and sponsored the Wildlife Summit and we appreciate their support on the Plan and other conservation initiatives.

We would also like to thank Martin J. McHugh, former Director of the Division of Fish and Wildlife, and Linda Tesauro, former Executive Director and founder of the Conserve Wildlife Foundation, for their support and assistance during the development of the Plan. We would especially like to thank Larry Niles, Ph.D., former Bureau Chief of the Endangered and Nongame Species Program, for his tireless efforts, innovative thinking, and endless support during the development and planning phase for implementation of the Wildlife Action Plan.

The inherent danger in writing an acknowledgment is not mentioning all the individuals and organizations that contributed. This is especially true for the New Jersey Wildlife Action Plan since so many people and organizations played key roles in its development. We encourage readers to carefully review Appendix V within the Plan that we hope includes all who participated in the development of the Wildlife Action Plan.

1 Restore Populations of Listed Species

Goal:

Restore populations of rare species to levels that allow their delisting.

Threat:

It is more costly to protect an imperiled species than to prevent a species from becoming imperiled. New Jersey is home to over 70 species listed by the state or federal government as threatened or in danger of extinction or extirpation.

Strategies:

Develop species recovery plans for species of greatest priority. These plans should establish clear and specific strategies for reducing threats and improving habitat conditions.

Implement species recovery plans that lead to viable populations that complement functioning ecosystems.

Reevaluate the status of listed species every five years.

Conduct research to identify migratory corridors for bats, marine mammals, fish, butterflies and moths, and dragonflies and damselflies.

Topic & Goal No.	Priority State-level Conservation Goals and Strategies as written within the NJ Wildlife Action Plan, February 16, 2007
(continued) Addressing National, Interstate, and Statewide Threats	
*	Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
	Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
	Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.
Addressing National, Interstate, and Statewide Threats	
Goal 9: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.	
*	Reduce regulatory impediments to restoration and enhancement activities.
*	Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
*	Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
*	Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
*	Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
	Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
	Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.
	Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by the Landscape Project map.
	Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.
Addressing National, Interstate, and Statewide Threats	
Goal 10: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.	
*	Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.

Topic & Goal No.	Priority State-level Conservation Goals and Strategies as written within the NJ Wildlife Action Plan, February 16, 2007
(continued) Addressing National, Interstate, and Statewide Threats & Long-term Monitoring	
*	Measure the enrollment acreage and effectiveness of backyard habitat management.
*	Complete the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.
*	Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
	Track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitor each site and evaluate the effectiveness of the management technique.
	Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.
Addressing National, Interstate, and Statewide Threats	
Goal 7: Identify, protect, and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).	
*	Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
*	Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
*	Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.
	Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
Addressing National, Interstate, and Statewide Threats	
Goal 8: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific** deer densities.	
*	Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
*	Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting, Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.
*	Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.

2 *Conserve Key Migratory Bird Corridors*

Goal:

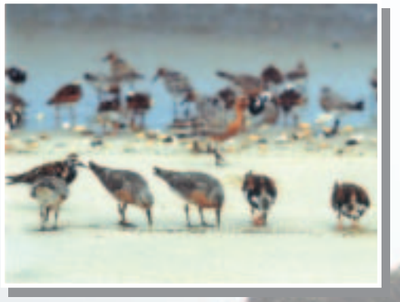
Conserve key migratory corridors and stopover locations for migratory birds.

Threat:

Each spring and fall, large numbers of migratory birds depend on access to high quality and abundant habitats now compromised by fragmentation and habitat loss or destruction.

Strategies:

Conduct surveys of migrating songbirds and raptors every five years at major stopover areas, primarily the Cape May Peninsula.



Monitor shorebird populations along the Delaware Bayshore each year.

Prioritize private land incentives to conserve migratory stopover habitat.

Protect a network of locations that help sustain migratory bird populations by producing a set of conservation recommendations for Important Bird Areas statewide.

3 Develop a Unified Approach to Land Management

Goal:

Encourage all land stewards to incorporate habitat management in their work plans and manage their lands to maintain or improve ecological integrity.

Threat:

Management of private and public lands impacts habitat and significantly influences which species can exist there. Forestry practices, agricultural activities, utility projects, and other land use practices can hurt wildlife if their needs are not considered in the project plan.

Strategies:

Strengthen the New Jersey Habitat Incentive Team (NJ HIT), a program that provides technical expertise and assistance to landowners seeking to manage their lands for wildlife.

Increase enrollment in the Landowner Incentive Program (LIP) and the number of landowners involved with NJ HIT so that more grassland is managed for ground-nesting birds.

Develop "Best Management Practices" to reduce the impacts of land practices that negatively affect species of conservation concern.

Develop site-based management plans with wildlife and habitat production goals by using the Landscape Project as a guide.

Strengthen and implement protection for biodiversity on all public lands and aquatic systems.

Topic & Goal No.	Priority State-level Conservation Goals and Strategies as written within the NJ Wildlife Action Plan, February 16, 2007
(continued) Addressing National, Interstate, and Statewide Threats & The Landscape Project	
	Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available.
	Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
Addressing National, Interstate, and Statewide Threats	
Goal 5: Maintain **connectivity of habitats** at the landscape scale.	
*	Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
*	DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
*	Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
*	Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.
Addressing National, Interstate, and Statewide Threats & Long-term Monitoring	
Goal 6: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases to determine the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.	
*	Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following: • Breeding Bird Atlas • Breeding Bird Survey • Delaware Bay Migratory Shorebird Survey • Bald Eagle Midwinter Survey • Herptile Atlas • Calling Amphibian Monitoring Program • Fish Monitoring-Streams and Ponds • Freshwater Mussel Atlas • Mid-Winter Waterfowl Survey • Atlantic Flyway Breeding Waterfowl Survey • DFW Bobwhite Call-Count Survey • Woodcock Call-Count Survey • DFW Beaver-Otter Survey • Migratory Game Bird Banding Programs • Colonial Waterbird Survey • Beach Nesting Bird Survey • Site-specific Fish Monitoring Programs

Topic & Goal No.	Priority State-level Conservation Goals and Strategies as written within the NJ Wildlife Action Plan, February 16, 2007
Addressing National, Interstate, and Statewide Threats	
Goal 3: Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.	
*	Increase staff in the NJ Habitat Incentive Team (N J HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
*	Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
*	Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
*	Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using the Landscape Project and principles of landscape ecology as the foundation.
	Increase the number of Category 1 streams justified by endangered and threatened species data.
Addressing National, Interstate, and Statewide Threats & The Landscape Project	
Goal 4: Identify and protect breeding, migration, and wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.	
*	NJ Division of Fish and Wildlife (DFW) will lead in the training of municipal and county planners to use the Landscape Map to identify critical wildlife habitats for sensitive species and natural systems within their borders.
*	Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition, and land planning at all levels of government and non-government organizations.
*	DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.
*	Mitigate impacts of existing development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
	Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.
	Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.

4 *Minimize Habitat Loss*

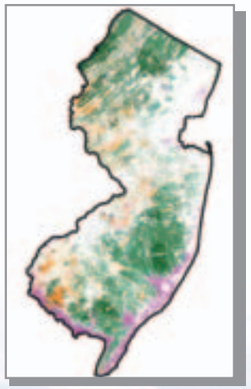
Goal:

Protect essential breeding, wintering, and migration habitat for wildlife of conservation concern.

Threat:

The greatest threat to New Jersey's wildlife is loss of habitat. To exist and thrive in New Jersey, wildlife species require habitat to live, grow, and reproduce.

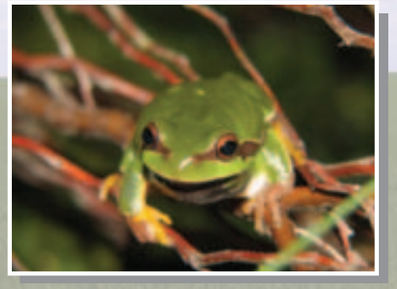
Strategies:



Train municipal and county representatives, using programs implemented by the Division of Fish and Wildlife, to use the Landscape Project to identify critical habitat within their borders.

Encourage municipal and county planners and non-governmental agencies to include wildlife conservation into the planning process using the Landscape Project and other Geographic Information System (GIS) products.

Encourage towns and counties to develop, as part of their master plan, Habitat Conservation Plans that consider the larger landscape region.



Implement programs and initiatives to create and enhance habitat in developed areas.

Guide management of all lands purchased with Green Acres funds through coordination of the conservation goals, strategies, and actions outlined in the NJ Wildlife Action Plan and the Landscape Project Map.

5 *Minimize Habitat Fragmentation*

Goal:

Maintain connected habitats.

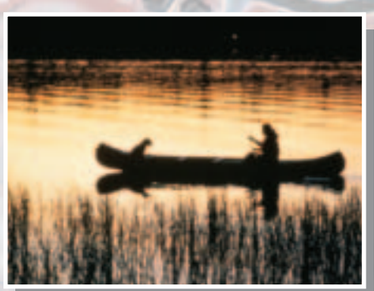
Threat:

Following habitat loss, habitat fragmentation is the second most serious threat to wildlife in New Jersey. Habitat fragmentation increases susceptibility to predation, disease, and parasitism, and creates genetic weaknesses by isolating populations. Fragmentation can also create barriers that prevent animals from moving between essential habitats.

Strategies:

Advance smart growth planning as a tool to minimize habitat loss and optimize regional approaches to land use planning.

Prioritize open space land acquisition with habitat connectivity as a primary focus.



Promote Habitat Conservation Plans to inform local and regional government master plans and land use ordinances.

Encourage towns and counties to develop their own Habitat Conservation Plans with assistance from the NJ DEP.

NJ Wildlife Action Plan
State-level Conservation Goals and Strategies

This table provides a list of all the priority state-level conservation goals and strategies (actions) for New Jersey as written within the NJ Wildlife Action Plan, February 16, 2007. This brochure contains highlighted conservation strategies, pages 4 - 16, that have been reworded for a more general audience. These strategies have been identified below by the asterisk (*) and are shown here in their original format as written within the Plan. All other strategies shown below are considered priorities, but were not highlighted in the previous pages. In addition, the goals and associated strategies are arranged in categories with key words and concepts appearing in bold to provide focus for the array of New Jersey's partners in the conservation of our native wildlife and their habitats. These categories are also identified within the Plan. It is important to note, the category *Addressing National, Interstate, and Statewide Threats*, contains sub-categories such as *Development, Road Mortality to Wildlife*, and many more. As such, goals and strategies identified below may be a compilation of strategies taken from multiple sub-categories.

To review all of the state-level conservation goals and strategies, please visit the NJ Wildlife Action Plan Web site: www.njfishandwildlife.com/ensp/waphome.htm

Topic & Goal No.	Priority State-level Conservation Goals and Strategies as written within the NJ Wildlife Action Plan, February 16, 2007
Endangered, Threatened and Rare Wildlife	
Goal 1: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protection of critical habitat, and habitat restoration and enhancement.	
*	Develop and implement recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
*	Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
*	Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.
Migratory Stopover and Important Bird Areas Planning	
Goal 2: Identify, monitor, and **conserve key migratory corridors and stopover locations** for migratory birds.	
*	Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
*	Annually monitor shorebird populations along the Delaware Bayshore stopover.
*	Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.
*	Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
	Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers, and other "human-made" tall structures.
	Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach and inland habitats important to migrating birds.

13 Coordinate Conservation Activities

Goal:

Ensure that conservation activities carried out across the state are consistent with the Wildlife Action Plan.

Threat:

Lack of coordination between the multiple agencies and organizations engaged in wildlife conservation work can result in the inefficient use of resources. The Wildlife Action Plan is a comprehensive blueprint for the conservation of wildlife statewide. Integration of the Plan into other management plans will greatly enhance the success of the Wildlife Action Plan as a whole as well as the future of NJ's wildlife and their critical habitats.

Strategies:

Post the most current version of the Wildlife Action Plan on the Division of Fish and Wildlife's Web site so it is accessible to everyone.

Review the Wildlife Action Plan every five years with a process that includes adaptive management techniques.

Incorporate the goals and strategies of the Wildlife Action Plan into new and existing management plans through a partnership between the Division of Fish and Wildlife and other public (federal, state, regional, and local) and private agencies.

Convene annual meetings of representatives from the Endangered and Nongame Species Advisory Committee, the Fish and Game Council, and the Marine Fisheries Council to review the progress of the Wildlife Action Plan.

6 Continue Long-term Monitoring

Goal:

Continue long-term monitoring to evaluate the effectiveness of protection and restoration efforts on wildlife and their habitats.

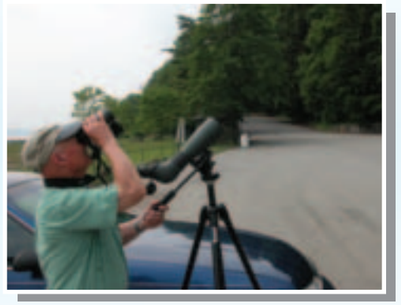
Threat:

Many threats to wildlife and their habitats occur subtly over long periods of time and can have broad-ranging or localized effects. These threats are often insidious and by the time their effects are recognized they are difficult to remedy.

Strategies:

Maintain existing monitoring programs that collect data on species and habitats statewide.

Measure the enrollment acreage in habitat enhancement and conservation programs and monitor each site to evaluate the effectiveness of management techniques.



Complete the Coordinated Bird Monitoring Plan that, when implemented, will help populate the database developed through regional and national bird surveys.

Develop Geographic Information System (GIS) measures to evaluate the effectiveness of habitat conservation programs.

7 Minimize Human Disturbance

Goal:

Minimize human disturbance at locations with sensitive wildlife species.

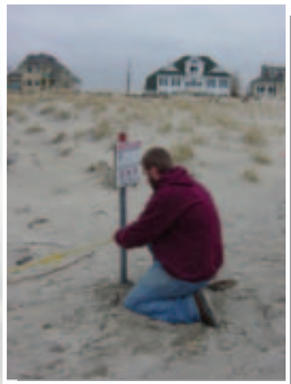
Threat:

Some wildlife species are highly sensitive to human disturbance. While many common species can tolerate a high level of human disturbance and encroachment into their habitat, others simply abandon habitats as disturbance increases.

Strategies:

Design and implement protective measures at sites containing species most susceptible to disturbance from human activities.

Gate at bat hibernaculum



Sign posting at bird colony

Apply restrictions on acoustic disturbances and other activities that impair aquatic wildlife.

Research the impacts of water releases on aquatic organisms using new and existing data.

Maintain a regular review of data on water releases from power plants and stream encroachment permits to develop recommendations to minimize impacts on aquatic life.

12 Protect Public Natural Lands and Waterways

Goal:

Protect public natural lands and waterways from off-road vehicle and personal watercraft use where wildlife species of conservation concern are located.

Threat:

Off-road vehicles (ORVs) and personal watercraft can have a serious negative impact on species of conservation concern. These vehicles are able to access remote areas inhabited by protected species and species of concern. ORVs and personal watercraft can physically damage habitats, directly harm slow-moving animals, and create noise disturbances that can cause reproductive failures, site abandonment, and failures of entire populations.

Strategies:

Enforce restrictions on off-road vehicles and personal watercraft use in areas where critical wildlife habitats occur.

Fund additional law enforcement officers to assist in enforcing restrictions on off-road vehicle and personal watercraft use.

Enact legislation to require registration of all off-road vehicles.

Research and disseminate information about the economic impacts of off-road vehicles and personal watercraft on those wildlife species most vulnerable to injury, mortality, or disturbance.

11 Eliminate Contamination

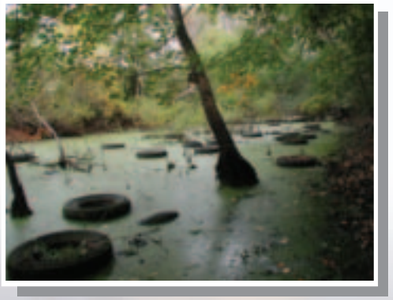
Goal:

Eliminate or reduce exposure of wildlife to all sources of contamination.

Threat:

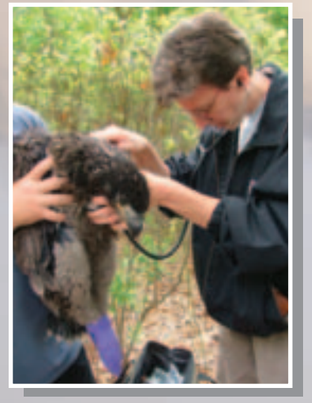
Historically, pollution has led to the near extinction of many species of wildlife and fish. Today, pollution is heavily regulated but contaminants such as petroleum, DDT, and PCB's still pose a threat to New Jersey's wildlife.

Strategies:



Reduce contaminants to levels that have no adverse effects on wildlife in areas where contamination is currently impacting wildlife populations, such as the lower Delaware River, the NJ-NY Harbor, and portions of the Atlantic Coast.

Assess contaminant exposure by analyzing tissues of raptors and waterbirds and their prey on a regular basis.



Analyze tissue samples of raptors to assess causes of mortality and nest failure.

8 Set Deer Density Goals that are Area-specific

Goal:

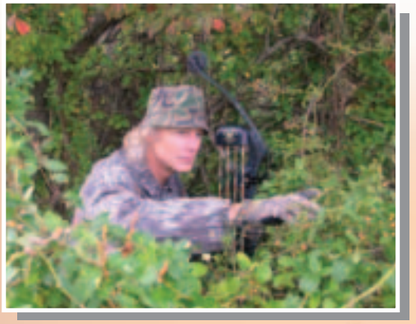
Develop sustainable deer density goals that are area-specific and support healthy, natural vegetative communities.

Threat:

The density of the deer population in parts of New Jersey has a negative impact on natural vegetative communities and therefore can have detrimental impacts on native wildlife populations.

Strategies:

Develop deer management plans, including harvest quotas, focused on meeting forest health goals by measuring the status of vegetation in important habitats across the state.



Develop and implement legislative and incentive-based programs to support increased hunting opportunities.

Fully fund and promote programs like Hunters Helping the Hungry that allow hunters to donate venison to food kitchens.

Achieve deer densities compatible with the Wildlife Action Plan's management goals through community-based deer management programs and the participation of private landowners and public land stewards.

9 Protect Unique Ecosystem Processes

Goal:

Identify and protect unique ecosystem processes.

Threat:

Human intervention in natural processes can adversely impact ecosystems. Suppressing forest fires, restricting tidal flow, and introducing invasive species of plants and animals can alter the balance of an ecosystem to the detriment of native wildlife.

Strategies:

Develop techniques that can be used to safely mimic the historic role of fire in shaping certain ecosystems.

Identify and prioritize the threats to ecosystem processes.

Restore natural tidal flow to coastal wetlands to reduce non-native and/or invasive vegetation like common reed (*Phragmites australis*).

Develop and use "Best Management Practices" for species, habitat, and ecosystem management.

10 Reduce Impacts from Subsidized Predators and Invasive Species

Goal:

Reduce adverse impacts on critical wildlife and natural communities and habitat from subsidized predators and invasive species, both native and non-native.

Threat:

A subsidized predator is an animal that benefits from resources provided by human activities such as bird feeders, accessible pet food, accessible garbage, etc. These subsidies can create high predator densities that pose a significant threat to local wildlife populations. Invasive non-native species and overabundant native species also present a significant threat to wildlife populations.

Strategies:

Create aggressive outreach programs that reduce or eliminate the introduction and spread of invasive plants and animals.

Anti-predator fencing at a nest.

Use integrated predator management techniques to increase the reproductive success of wildlife species of greatest concern.

Establish guidelines so land managers can effectively deal with cat colonies and other subsidized predators when they pose a threat to vulnerable wildlife, especially endangered and threatened species.

Educate the public about the impacts of feral and free-roaming house cats on New Jersey's native wildlife and encourage responsible cat ownership.

Implement a system to report new locations of priority invasive species.

Attachment F: Report on Piedmont Plains Regional Landscape Stakeholder Implementation Meeting (September 7, 2006)

DRAFT
Summary Report on the Wildlife Action Plan Piedmont Plains Implementation Meeting

Environmental Law Institute
to
New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program

September 2006

Executive Summary

In February 2006, the Conserve Wildlife Foundation of New Jersey, in partnership with the New Jersey Department of Environmental Protection's Division of Fish and Wildlife, convened over 40 stakeholders from organizations that focus on statewide issues. The first statewide stakeholders' meeting was held at Duke Farms in Hillsboro, New Jersey. Their role was to discuss and select priority state-level goals from those identified in the New Jersey Wildlife Action Plan. Stakeholders identified 13 priority state-level goals, which can be found in Attachment A.

The second statewide Wildlife Action Plan Stakeholder Meeting was held on Thursday, April 6, 2006, at Duke Farms. The primary goal of the meeting was to solicit stakeholder input into prioritizing state-level conservation strategies (actions) associated with the 13 priority state-level conservation goals identified at the first meeting. Participants from organizations that focus on statewide issues discussed and debated the state-level conservation strategies and provided their input on refining and prioritizing them. Seventy-two conservation strategies were selected as priorities. These can also be found in Attachment A.

On Thursday, September 7, 2006, local stakeholders associated with the Piedmont Plains Regional Landscape were convened at the Piedmont Plains Wildlife Action Plan Implementation Meeting held at the D&R Greenway Land Trust's Princeton headquarters (Attachment B). This was the first of five regional landscape meetings to be held throughout the state. The goal of this meeting was to identify a set of priority conservation actions to drive implementation of the state's Wildlife Action Plan in the Piedmont Plains Regional Landscape.

Background

On Thursday, September 7, 2006, the Conserve Wildlife Foundation of New Jersey (CWF) convened the Piedmont Plains Wildlife Action Plan Implementation Meeting in partnership with the New Jersey Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW). The meeting was hosted by the D&R Greenway Land Trust and held at the Greenway's Johnson Education Center in Princeton, New Jersey.

The meeting was the first of five Wildlife Action Plan landscape-level prioritization meetings. Approximately twenty-eight (28) stakeholders who attended the meeting worked to identify a subset of 57-60 priority conservation actions from those identified within the state's Wildlife Action Plan. This subset of priority conservation actions will be used by DFW and its conservation partners to guide conservation efforts and resources toward implementation of the state's Wildlife Action Plan in the Piedmont Plains Regional Landscape.

The New Jersey Wildlife Action Plan is a proactive plan to conserve wildlife before they become more rare and more costly to protect. The multi-scale plan identifies threats, conservation goals, and conservation actions at the state, landscape (5 regions; ocean is currently part of the Atlantic Coastal Regional Landscape), and sub-regional levels (identified as conservation zones within New Jersey's plan). New Jersey submitted its plan to the U.S. Fish and Wildlife Service on October 1, 2005, submitted its revised plan on July 26, 2006, and received final approval from the Service in September 2006.

The New Jersey Wildlife Action Plan is a living document and will undergo periodic revisions per comments and recommendations received by the public, through the regional stakeholder meetings, and as part of the adaptive management strategy outlined within the Plan. Digital copies of the Plan are available at the Division of Fish and Wildlife's Web site: www.state.nj.us/dep/fgw/ensp/waphome.htm

Summary of Piedmont Plains Implementation Meeting

The objectives of the Piedmont Plains Implementation Meeting were to convene regional leaders and stakeholders to:

- Review the Piedmont Plains Regional Landscape conservation goals and actions;
- Seek stakeholder input to determine priority conservation actions for the Piedmont Plains Regional Landscape; and
- Provide an opportunity for stakeholders to discuss and seek clarification on priority conservation actions for the Piedmont Plains Regional Landscape.

The Piedmont Plains Regional Landscape section of the New Jersey Wildlife Action Plan includes a number of goals, all of which are considered priorities. These goals focus on habitat conservation and protection, the conservation of populations of

species of greatest conservation need, water quality, public education and viewing opportunities, improving biodiversity, restoring natural processes, and more. Each of the goals has a varying number of conservation actions associated with them that were developed to address the specific needs of each conservation zone (sub-regional level) within the Piedmont Plains Regional Landscape. The desired outcomes of the prioritization exercise were to:

- Provide local leaders and stakeholders with background on the objectives of the Wildlife Action Plan and its implementation;
- Provide a foundation for potential partnerships to implement the Wildlife Action Plan; and
- Seek stakeholder input on and identify 57-60 specific and broad-based* priority conservation actions for the Piedmont Plains Regional Landscape.

In preparation for the working meeting, the invited stakeholders were asked to review *in advance* the Piedmont Plains' goals and actions and to prioritize the actions according to instructions provided. The majority of the day was devoted to further discussion and final prioritization of the conservation actions.

Introductory Sessions
Linda Mead, Executive Director of the D&R Greenway Land Trust, welcomed participants to the group's new headquarters' building.

Larry Niles, former Chief of DEP's Endangered and Nongame Program (ENSP), provided the attendees with background on the purpose of the New Jersey Wildlife Action Plan, its basis in the Landscape Project, and stated that the plan is designed to be a blueprint for wildlife conservation for the full array of non- traditional partners conservation partners in the state, not solely the Division of Fish and Wildlife.

Dave Jenkins, Acting Chief of ENSP, gave welcoming remarks. His presentation focused on the conservation potential in New Jersey and he discussed the role and importance of partnerships in achieving conservation objectives in New Jersey.

Kris Schantz, a senior biologist with ENSP and coordinator of the New Jersey Wildlife Action Plan, gave a summary of the priority actions selected by participants in advance of the meeting. She stated that for the Piedmont Plains

Region, the plan includes 12 broad-based* conservation goals and 128 specific and broad-based* conservation actions associated with those goals. She also provided participants with copies of the state-level Wildlife Action Plan brochure which highlights the state-level priority goals and strategies (actions) selected at the stakeholders' meetings in February and April, 2006, and solicited their feedback on the document.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

Amanda Dey, a senior biologist with ENSP responsible for the Piedmont Plains Regional Landscape, briefly discussed the threats to the Piedmont Plains Landscape habitat and wildlife and DEP's role in conservation in the region.

Troy Ettel, Vice President for Conservation at New Jersey Audubon Society (NJAS) and Anne Heasly, coordinator of the Raritan Piedmont Wildlife Habitat Partnership, gave a presentation on the project. With seed money from the Doris Duke Charitable Foundation, NJAS co-founded the Partnership, which focuses on the protection and management of critical wildlife habitats within three closely associated grassland tracts in central New Jersey. The first phase of the project concentrates on grassland habitats since this geographic area historically included some of the largest grassland areas in the state and supported breeding populations of each of the State's threatened and endangered grassland birds. Duke Farms lies at the center of the first region, the second region is 6-Mile Run State Park in Franklin Township, and the third lies mostly within East Amwell in western Hunterdon County. NJAS wrote the conservation plan for the project and is currently working with a broad coalition of partners that includes the Conservation Resources, D&R Greenway, Duke Farms, New Jersey Conservation Foundation, and the New Jersey Endangered and Nongame Species Program to implement the conservation plan.

Jessica Wilkinson, Director of the Environmental Law Institute's State Biodiversity Program, served as the facilitator and gave the participants an overview of the meeting objectives.

Facilitated Discussion

The majority of the remainder of the day was devoted to a discussion of the conservation actions associated with each of the region's conservation goals. Wilkinson led the participants through a discussion of each of the goals in turn. She asked participants to offer their comments on which of the conservation actions they considered to be of particular importance and which they felt were of lesser importance. In addition, participants were able to seek clarification on any of the actions that were unclear.

After a thorough discussion of the actions associated with each goal, the participants were asked to select a predetermined number of conservation actions they considered the highest priority for implementation within that goal. The number of actions participants were asked to select for each goal are found in Chart 1 below. In addition, ENSP staff assured the stakeholders that the potential edits to the actions discussed at the meeting would be reviewed and incorporated where feasible, and the actions would also be revised to include measurable outcomes. The results of

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

the participants' selection and the original and revised actions can be found in Attachment D.

	Number of conservation actions per goal
Goal 1	13
Goal 2	2
Goal 3	5
Goal 4	10
Goal 5	11
Goal 6	2
Goal 7	2
Goal 8	3
Goal 9	1
Goal 10	2
Goal 11	1
Goal 12	5

Chart 1: Number of conservation actions participants were asked to select for each of the conservation goals.

Concluding Presentations

Bill Rawlyk, Director of Land Preservation and Naturalist at D&R Greenway, gave a presentation on the wildlife and habitat restoration project implemented on his family's farm. Funding for the project has come from a wide variety of sources, including DEP, U.S. Department of Agriculture, and U.S. Fish and Wildlife Service. Fran Rapa, Chairman of the Woodstown/Pilesgrove Environmental Council, gave a presentation on how the town has incorporated recommendations from the Wildlife Action Plan into the municipality's comprehensive plan.

Dave Jenkins and Kris Schantz gave closing remarks and thanked the participants for their time and contributions.

ATTACHMENTS:

A: Priority State-level Conservation Goals and Strategies (Actions)
B: List of Piedmont Plains Regional Landscape Invitees and Attendees
C: Piedmont Plains Wildlife Action Plan Stakeholder Meeting Final Agenda
D: Piedmont Plains Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Attachment A: Priority State-level Conservation Goals and Strategies (Actions)

New Jersey Wildlife Action Plan
Priority State-level Goals and Strategies

Below you will find thirteen priority state-level goals identified at the First Wildlife Action Plan Stakeholder Meeting held on February 23, 2006, and the associated priority conservation strategies identified at the Second Wildlife Action Plan Stakeholder Meeting held on April 6, 2006. The goals have been categorized by the main topic and, where appropriate, the sub-topic as identified within the New Jersey Wildlife Action Plan. The goals and associated priorities have been arranged in categories and key words and concepts appear in bold to provide focus for the array of New Jersey partners in conservation, land managers and stewards, outreach initiatives, and residents interested in managing their lands to support native wildlife.

All of the goals and strategies have integrated public education and outreach and are to be implemented with an active adapted management strategy. The New Jersey Division of Fish and Wildlife hopes to receive continual feedback on implementation successes and failures that our state can integrate into the Wildlife Action Plan and implementation process.

Addressing National, Interstate, and Statewide Threats

Suburban sprawl and large-acre zoning

Goal: Identify and **protect** breeding, migration, and wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.

1. NJ Division of Fish and Wildlife (DFW) will collaborate with municipal and county planners to identify critical wildlife habitats for sensitive species and natural systems within their borders.
2. Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.
3. Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition, and land planning at all levels of government and non-government organizations.
4. Mitigate impacts of existing development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
5. Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
6. Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available.
7. DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include

clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.

8. Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
9. Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.

Goal: Maintain **connectivity of habitats** at the landscape scale.

1. Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
2. DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
3. Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
4. Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

Goal: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.

1. Reduce regulatory impediments to restoration and enhancement activities.
2. Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
3. Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
4. Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
5. Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
6. Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.

7. Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by GIS analysis.
8. Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
9. Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.

Goal: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.

1. Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
2. Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
3. Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
4. Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies, and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:.
    a. A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations.
    b. A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    c. A model ordinance for regulating feeding of wildlife.
    d. A model pet licensing ordinance.
    e. Mapping of colonies to evaluate impact on species of conservation concern.
5. Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
6. Create and implement a system for reporting and qualifying new locations of priority invasive species.
7. Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
8. Create implementation plan for Invasive Species Task Force recommendations when completed.

Unsustainable Land Management Practices on both Private and Conserved Lands and Water

Goal: Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

1. Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
2. Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
3. Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
4. Through surveys, increase the number of Category 1 streams justified by endangered and threatened species data.
5. Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using GIS and principles of landscape ecology as the foundation.

Direct Human Impacts on Native Wildlife and Ecosystem Health

Goal: Identify, protect, and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

1. Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
2. Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
3. Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
4. Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.

Development and Long-term Monitoring

Goal: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases to determine the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.

1. Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following:
   - o Breeding Bird Atlas
   - o Breeding Bird Survey
   - o Delaware Bay Migratory Shorebird Survey
   - o Bald Eagle Midwinter Survey
   - o Herptile Atlas
   - o Calling Amphibian Monitoring Program
   - o Fish Monitoring-Streams and Ponds
   - o Freshwater Mussel Atlas
   - o Mid-Winter Waterfowl Survey
   - o Atlantic Flyway Breeding Waterfowl Survey
   - o DFW Bobwhite Call-Count Survey
   - o Woodcock Call-Count Survey
   - o DFW Beaver-Otter Survey
   - o Migratory Game Bird Banding Programs
   - o Colonial Waterbird Survey
   - o Beach Nesting Bird Survey
   - o Site-specific Fish Monitoring Programs
2. Complete the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.
3. Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
4. Measure the enrollment acreage and effectiveness of backyard habitat management.
5. Through GIS, track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitor each site and evaluate the effectiveness of the management technique.
6. Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.

High Deer Densities

Goal: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific deer densities**.

1. Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
2. Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting,

Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.

3. Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
4. Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.
5. Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
6. Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.

Contaminants

Goal: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination**.

1. Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
2. Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
3. Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

Motorized Recreation Vehicles

Goal: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use**.

1. Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.

2. Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
3. Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
4. Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
5. Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.

Endangered, Threatened and Rare Wildlife

Goal: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protection of critical habitat, and habitat restoration and enhancement.

1. Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
2. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
3. Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.

Migratory Stopover and Important Bird Areas Planning

Goal: Identify, monitor, and **conserve key migratory corridors and stopover locations** for migratory birds.

1. Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
2. Annually monitor shorebird populations along the Delaware Bayshore stopover.
3. Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.
4. Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.

5. Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers, and other "human-made" tall structures.
6. Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.

Review of Wildlife Action Plan

Goal: Ensure that **conservation activities** of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan (Plan).

1. The most current version of the Plan will be continually available for review on the Division of Fish and Wildlife's Web site with an open invitation to submit comments.
2. Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the Endangered and Nongame Species Advisory Committee (ENSAC), and a wildlife summit in which adaptive management will be built into the revision.
3. DFW will work with federal, state, county, municipal, and private (NGOs) land managers to incorporate the goals and strategies of the Plan into current management plans by the first formal review in 2011.
4. Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the ENSAC, the Fish and Game Council, and the Marine Fisheries Council.

Attachment B: List of Piedmont Plains Regional Landscape Invitees and Attendees

Piedmont Plains Regional Landscape Stakeholder Meeting: Wildlife Action Plan

List of Attendees

First	Last	Organization	Invited	Attended
Thom	Almendinger	Doris Duke Charitable Foundation, Duke Farms	X	
Jim	Amon	D & R Greenway Land Trust	X	X
Chris	Aquila	Doris Duke Charitable Foundation, Duke Farms	X	
Naomi	Avissar	Conserve Wildlife Foundation of NJ	X	X
Francis	Banisch	Banisch Associates	X	
Sandy	Batty	ANJEC	X	
Matt	Blake	American Littoral Society	X	
Frances	Blanco	Dir. Recreation, Natural Resources & Culture	X	
Andrew	Bowman	Doris Duke Charitable Foundation	X	X
Barbara	Brummer	The Nature Conservancy-NJ Chapter	X	
Jennifer	Bryson	Sourlands Planning Council	X	
Michele	Byers	New Jersey Conservation Foundation	X	
Tracey	Carluccio	Delaware Riverkeepers	X	
Marion	Cartwright	D & R Greenway Land Trust	X	X
Tara	Casella	Essex County Parks	X	
Michael	Catania	Conservation Resources Inc	X	X
Robert	Ceberio	Hackensack Meadowlands Commission	X	
Nichole	Ciccaglione	USDA/NRCS - Freehold Service Ctr.	X	
Kathy	Clark	NJ DEP, DFW, ENSP	X	
Angela	Clerico	Banisch Associates	X	X
Maria	Collazo	USDA/NRCS - Hainesport Service Ctr.	X	
Phillip	Collins	NJ DEP, Green Acres	X	
Ellen	Creveling	The Nature Conservancy-NJ Chapter	X	X
Dennis	Davidson	D & R Greenway Land Trust	X	X
Debra	Davidson	Tenafly Nature Center	X	

ATTACHMENT B (continued)

First	Last	Organization	Invited	Attended
Dave	Dendler	Somerset County Park Commission	X	
Emile	DeVito	NJ Conservation Foundation	X	X
Mandy	Dey	ENSP	X	X
Timothy	Dey	USDA/FSA - Freehold Service Ctr.	X	
Joe	DiVincenzo	Essex County Executive	X	
Donna	Drewes	Municipal Land Use Center	X	
Miriam	Dunne	NRCS/USDA	X	X
Tim	Dunne	NRCS/USDA	X	X
Cynthia	Ehrenclou	Upper Raritan Watershed Association	X	
David	Epstein	Morris Land Conservancy	X	
Troy	Ettel	New Jersey Audubon Society	X	X
Craig	Evans	Hunterdon-Dept. Parks & Recreation	X	
Caren	Fishman	Camden County Parks	X	
John	Flynn	NJ DEP, Green Acres	X	
Thomas	Gilmore	New Jersey Audubon Society	X	
Amy	Goldsmith	NJ Environmental Federation/Clean Water Action	X	
Rodney	Groff	Gloucester County Parks	X	
Ernie	Hahn	D&R Canal Commission	X	
Jim	Hall	Palisades Interstate Park Commission	X	
Anne	Heasley	Conservation Resources Inc.	X	X
Susan	Herron	D&R Canal State Park, Kingston Office	X	
Harriet	Honigfeld	Monmouth County Planning Board	X	
Gene	Huntington	Doris Duke Charitable Foundation, Duke Farms	X	
Dave	Jenkins	NJ DEP, DFW, ENSP – Acting Chief	X	X
Rob	Jennings	Morris County Park Commission	X	
Kenneth	Jennings	Hudson County	X	
Andrew	Johnson	The William Penn Foundation	X	
Jeffrey	Kerchner	Burlington County Parks	X	

ATTACHMENT B (continued)

First	Last	Organization	Invited	Attended
Bill	Kibler	South Branch Watershed Association	X	
Kathy	Klein	Partnership for the Delaware Estuary	X	
William	Koch	Great Swamp National Wildlife Refuge	X	X
Kim	Korth	NJ DEP, DFW, ENSP	X	X
Rick	Lear	Middlesex County Parks	X	
Ed	McCaffrey	County of Hunterdon, Dept of Parks and Recreation	X	X
Anthony	McCracken	Somerset County Planning Board	X	
Fawn	McGee	NJ DEP, Green Acres	X	
Steve	Mars	US Fish and Wildlife Service	X	X
Linda	Mead	D & R Greenway Land Trust	X	
Kevin	Moore	Weequaic Park Association	X	
Nick	Morolda	USDA/FSA - Hainesport Service Ctr.	X	
Susan	Nanney	Passaic River Coalition	X	
Larry	Niles	Former Chief, ENSP – NJ DEP, DFW	X	X
Terrence	Nolan	Trust for Public Land	X	
Margaret	O'Gorman	Conserve Wildlife Foundation of NJ	X	X
Sharon	(DeFalco) Petzinger	ENSP	X	X
Fran	Rapa	Woodstown/Pilesgrove Environmental Council, Chairman	X	X
Bill	Rawlyk	D & R Greenway Land Trust	X	X
Greg	Remaud	NY-NJ Baykeeper	X	
Barbara	Rich	Rancocas Conservancy	X	
Steven	Sacks-Wilner	Sourlands Planning Council	X	
Kris	Schantz	NJ DEP, DFW, ENSP	X	X
Tina	Schvejda	Meadowlands Conservation Trust	X	
Julia	Somers	Great Swamp Watershed Association	X	
John	Staples	US Fish and Wildlife Service	X	
Eric	Stiles	New Jersey Audubon Society	X	
Ted	Stiles	Friends of Hopewell Valley Open Space	X	

ATTACHMENT B (continued)

First	Last	Organization	Invited	Attended
Patricia	Sziber	Friends of Hopewell Valley Open Space	X	X
Timothy	Taylor	Doris Duke Charitable Foundation, Duke Farms	X	
Kenneth	Thoman	Monmouth County Parks System	X	X
Celeste	Tracy	Delaware River Greenway Partnership	X	X
John	Trontis	Hunterdon Co. Dept. of Parks & Recreation	X	
Bob	Tudor	Delaware River Basin Commission	X	
Mike	VanClef	-	X	X
Mick	Valent	NJ DEP, DFW, ENSP	X	X
Nora	Wagner	Doris Duke Charitable Foundation, Duke Farms	X	
Jim	Waltman	Stony-Brook Millstone Watershed Assoc.	X	
Jay	Watson	NJ DEP, Deputy Commissioner	X	
Tom	Wells	The Nature Conservancy – NJ Chapter	X	
Jessica	Wilkinson	Environmental Law Institute	X	X

Attachment C: Piedmont Plains Wildlife Action Plan Stakeholder Meeting Final Agenda

ATTACHMENT C

ConserveWildlife
FOUNDATION OF NJ

Wildlife Action Plan
Piedmont Plains Regional Landscape Implementation Meeting
Thursday September 7th
9:00 a.m. to 4:30 p.m.

8:30 - 9:00 a.m. Coffee and Introductions

9:00 a.m. Welcome Linda Mead, Executive Director, D&R Greenway Land Trust

9:15 a.m. Introduction (Larry Niles and Dave Jenkins)

9:35 a.m. Overview of the day (Jessica Wilkinson)

9:45 a.m. Threats to wildlife in the Piedmont (Amanda Dey)

9:50 a.m. Summary of high priority actions per pre-meeting exercise (Kris Schantz)

10:00 a.m Raritan Piedmont Wildlife Habitat Partnership (Troy Ettel and Anne Heasly)

10:30 a.m. Break

10:45 a.m. Discussion of priority actions (Jessica Wilkinson)

11:55 a.m. Introduction to State Level Brochure for feedback (Kris Schantz)

Noon - Lunch

1:00 p.m. Discussion of priority actions (Jessica Wilkinson)

2:50 p.m. Question: Partnership Ideas and Ongoing Projects (Kris Schantz)

3:00 p.m. Break

3:15 p.m. Presentation - Habitat Restoration Project (Bill Rawlyk)

3:30 p.m. Presentation - Incorporating WAP into Local Plans (Fran Rapa)

3:45 p.m. Next Steps and Presentation and vote on final Prioritized List (Kris Schantz)

Attachment D: Piedmont Plains Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Appendix D

Wildlife Action Plan: Piedmont Plains Regional Landscape Implementation Prioritization - Conservation Goals and Actions

This worksheet was provided to the Piedmont Plains Regional Landscape stakeholders prior to and during the meeting held on September 7, 2006, at the D&R Greenway Land Trust's Princeton headquarters. Column E shows the recommendations and comments voiced at the meeting regarding the Wildlife Action Plan's (Plan) goals and actions for the Piedmont Region. Column F shows the Endangered and Nongame Species Program's response to the comments or revisions to the Plan per the recommendations. Column G identifies the actions selected as priority actions per the final prioritization exercise completed by the attending stakeholders. It is important to note that some of the actions identified below are compilations of multiple actions within the Plan. Actions with similar objectives may have been grouped below in an effort to simplify the prioritization process and meeting discussion.

Four conservation zones exist within the Piedmont Plains Landscape Region: the Northern Piedmont Plains (N), the Raritan Bay and Northern Atlantic (RB), the Central Piedmont Plains (C), and the Southern Piedmont Plains (S). The far left column identifies the conservation zones that address the specific conservation action.

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers		Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
1	**Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and nongame species and species of conservation concern.**					
	1a	***Forest***				
ALL		1a-1	Identify critical core forests and assess their condition for forest dwelling bats, red-shouldered hawk, barred owl, bobcat, timber rattlesnake, long-eared owl, wood turtle, northern pine snake, forest-interior songbirds, waterfowl, and cavity-nesters. Take action to protect, restore, maintain, create, and/or enhance forest habitat as appropriate: Preserve forests with > 10 hectares (24.7 acres) of forest core area, especially forests that are not near major highways; allow riparian areas to re-vegetate; avoid activities that result in fragmentation (roads, development, certain forestry practices); Retain old-growth forest, with complex forest structure, and abundant standing and fallen dead biomass. Manage forests for larger, more mature woodlands with large trees for cavity-nesters and with a canopy closure of > 80%. Old-growth forested wetlands must be preserved for barred owls and red-shouldered hawks. Second-growth forested wetlands of moderate wildlife value should be allowed to mature into an old-growth condition to create future barred owl and red-shouldered hawk habitat.	Overarching concern about using a figure (e.g. 24.7 acres) to address "suitable" forest core size. Indiana bats require 17 acres, while neotropical migrant songbirds require a larger area. This opens the door for destruction of smaller patches. There is also a concern for managing at > 80% canopy; seems exclusive of less dense forests such as cedar swamps in the south ...be either more specific or more general.	Action has been revised to include a short list of species and the potential forest sizes that are suitable agreeing that by helping these particular species, other species will benefit (interior forest passerines, interior forest raptors, bobcats, timber rattlesnakes, Indiana bats and bats in general).	**Priority**
ALL		1a-2	Identify, protect, and maintain coniferous and hemlock forests with >70% forest cover for priority bird species (black-throated green warbler, blue-headed vireo), reptiles and amphibians.			
ALL		1a-3	Identify and assess large core forest and forested wetland habitat and take action to restore, enhance and/or protect habitat on public and private lands through fee purchase, conservation easement, landowner incentives, and/or management plans. Establish or restore forested corridors between core forest patches and allow riparian areas to become reforested.		Actions 1a-3, 1a-4, 1a-5, and 1a-6, in general have been merged into a single action, although with some variation between conservation zones.	
N		1a-4	Act to identify, protect, maintain, enhance, restore, and/or create habitat, as appropriate. Work with land managers and private landowners to maintain old growth forest stands with large trees and large contiguous tracts of forest suitable for forest-interior species of raptors and passerines, and bobcats.	Action is repetitive (similarities between 1a-3, 1a-4, 1a-5, 1a-6). Action should also include forest managers and planners, and forest stewardships. Dave Jenkins, ENSP, stated that ENSP would make it explicit that this action would focus on forest assessment that focuses on non-commodity resources.		**Priority**
N - EXPAND TO ALL ZONES		1a-5	Maintain connectivity and/or restore forested habitats and corridors within and connecting adjacent conservation zones. Identify important corridors that connect large, contiguous tracts of forest. Target these areas for acquisition to maintain a system of large, connected tracts of forest.	One stakeholder pointed out that areas within the southern Piedmont are heavy agricultural area with fragmented forested habitat and that such habitat is important.		
RB, C		1a-6	Enhance and restore habitat on permanently protected natural lands and surrounding private lands (landowner incentive programs): Public natural lands serve as conservation centers for forest species; surrounding landowners are enlisted to manage their land to increase overall habitat size and connectivity to other suitable habitats.			

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers		Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
1-CONT'D	**CONT'D: Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and nongame species and species of conservation concern.**					
	1b	***Grassland and early-successional fields***				
ALL		**1b-1**	Identify and assess large core grassland habitat and take action to restore, enhance and/or protect habitat through fee purchase, conservation easement, landowner incentives, and/or management plans. Develop and guide implementation of best management practices to improve habitat quality for grassland and scrub-shrub communities and prevent destruction of nests and young, eggs and larvae by early mowing. Convert existing hay and/or row crops to warm season grass fields, where appropriate, using landowner incentive programs. Evaluate effectiveness of delayed mowing between warm season grass fields and cool season hay fields for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. Research different management techniques to understand the appropriateness of prescribed burning, mowing, and other methods for maintaining suitable habitat for northeastern grassland-dependent species.			**Priority**
ALL		**1b-2**	Maintain grassland and early-successional habitats where they occur; do not expand or create grassland and early-successional habitat at the expense of large forests and forested riparian areas. Acquire grassland habitat through direct purchase or easements; enlist private lands in preservation and management programs that offer long-term stability of a matrix of grassland schemes.			
ALL		**1b-3**	Identify, protect, and enhance existing grasslands important for endangered, threatened and special concern species; enhance large grasslands with potential to support a source population of grassland birds and American kestrels. Where appropriate create large grasslands areas by eliminating hedgerows, fences, or tree lines in areas where open land occupies a considerable amount of the surrounding landscape and grassland management is a reasonable management alternative. Identify adjacent habitats that can be managed to enhance the total size of suitable grassland habitat.			
N & RB		**1b-4**	Collaborate with large landfill operations to promote planting and management of capped landfills for grassland-dependent birds.	This action is important for urban areas, but also along the Delaware River and dredge sites. We may need to add this action to additional conservation zones.	ENSP considered these recommendations but ultimately determined that it is not relevant to the Delaware River dredge sites. Therefore, this comment was not incorporated.	
N, RB, C		**1b-5**	Develop best management practices (BMPs) for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance early-successional habitats.	This action should focus on implementing best management practices rather than developing them. We need long-term efforts & support to encourage utility companies to work with the state wildlife agency and partners in conservation.	Action was revised to, "Continue to develop, implement, and evaluate best management practices…"	
ALL		**1b-6**	Identify areas where scrub-shrub habitat can be created and/or maintained with little impact to forested, wetland, and grassland habitats to maintain populations of shrub-dependent butterflies and moths, reptiles, amphibians, and scrub-shrub birds such as the yellow-breasted chat, American woodcock and northern bobwhite quail.	Isn't this the same as action 1b-5?	No, this action focuses on scrub-shrub habitat outside of rights-of-way. ENSP will clarify to identify the difference.	**Priority**
	1c	***Aquatic, Wetland, riparian, and floodplain***				
N, RB, C		**1c-1**	Maintain and enhance forested riparian and floodplain areas for breeding bald eagles, forest raptors, long-legged wading birds, songbirds, reptiles and amphibians, and terrestrial and aquatic invertebrates.	Can we combine this action with action 1c-4?	No, these actions (1c-1 and 1c-4) refer to distinct populations in distinct areas.	
C & S		**1c-2**	Preserve and enhance riparian habitats to protect aquatic ecosystems for dwarf wedgemussels, tidewater muckets, and shortnose sturgeon. Incorporate freshwater mussel survey results into Riparian Landscape Project and determine critical areas for listed species and assess impact of aquatic invasive species on freshwater mussels.			
N & RB		**1c-3**	North: Develop a landscape-scale plan to restore degraded emergent wetlands adjacent to existing protected lands, such as the Meadowlands, for colonial waterbirds, freshwater marsh birds and other wildlife relying on emergent wetlands. RB: Since emergent wetlands such as the Meadowlands serve as source habitats, develop and implement proactive habitat management/conservation plans for colonial waterbirds that focus on habitat protection and restoration and population recovery.			

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers		Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
1-CONT'D	**CONT'D: Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and nongame species and species of conservation concern.**					
ALL		1c-4	Maintain, protect, and enhance freshwater and coastal riparian areas and emergent wetlands for viable populations of pied-billed grebe, American bittern, sedge wrens, rails, osprey, bog turtles, songbirds, raptors, long-legged wading birds, riparian reptiles and amphibians and invertebrates. Restrict human activity from nesting sites and encourage larger buffers for riparian areas and wetlands in permits as appropriate to provide egress for wildlife in developed regions and prevent degradation of riparian habitats. Maintain snags of dead trees within wetlands for red-headed woodpeckers and other cavity nesters.	Can we combine this action with action 1c-1?	No, these actions (1c-1 and 1c-4) refer to distinct populations in distinct areas.	**Priority**
ALL		1c-5	Identify and assess large core wetland and riparian habitat and take action to preserve all large (> 4.9 hectares, 12.1 acres) freshwater wetlands from development, draining, and other forms of habitat loss, and restore, enhance and/or protect habitat through fee purchase, conservation easement, landowner incentives, and/or management plans. Manage freshwater wetlands for wetland dependent species; create impoundments, maintain stable water levels during nesting season, restrict recreational activity, monitor contaminant levels; maintain hemi-marsh conditions by periodic reversal of vegetation succession to open up some of the extensive stands of emergent vegetation. Suitable habitat for nesting needs to be maintained in nearby areas during wetland management.	This action should also address isolated wetlands & vernal pools.	No, vernal pools are smaller areas than the focal areas of this action.	**Priority**
N, C, S		1c-6	Restore and maintain bog turtle habitat; provide incentives to landowners for long-term management of wet meadows by implementing prescribed grazing.	Can't this be combined with another action?	No, this is specific to incentive program-based management practices approved by the USFWS.	**Priority**
N		1c-7	Restore and enhance forest, emergent, riparian, and coastal wetlands (Hackensack Meadowlands) on permanently protected natural lands and surrounding private lands.			
ALL		1c-8	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and write queries to determine distributions of fishes identified as special concern by the Delphi process.			
ALL		1c-9	Protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Landscape Project's habitat mapping.			
N, C, S		1c-10	Enhance aquatic habitats by improving water quality through Category 1 antidegradation designations in waterbodies where listed or special concern species occur.			
ALL		1c-11	Encourage stream bank stabilization using native plants.			
N		1c-12	Maintain and enhance floodplain habitats for wildlife and storm water control.			
N, RB, & S		1c-13	Locate potential vernal pools and integrate certified vernal pools into the DEP regulations database and Landscape Project.	This action should be combined with action 1c-5.	No, vernal pools are smaller areas than the focal areas of action 1c-5.	
ALL		1c-14	Identify threats to vernal pools and devise strategies to protect species dependent upon vernal pool habitat.	ENSP needs to decide if this is a water quality action (2d) OR a habitat action - for placement and prioritization purpose only.	ENSP decided this action is focused on the habitat surrounding pools and is not a water quality focused action.	**Priority**
S	1d		Provide long-term protection for bald eagle habitats, including land acquisition and protection from human disturbance.			
N	1e		Collaborate with other agencies and conservation groups that collect data on breeding and wintering wildlife populations (New Jersey Meadowlands Commission, Hackensack and Hudson Riverkeepers, etc.) to identify and protect important habitats.			
ALL	1f		Incorporate Important Bird Areas into Landscape Project mapping when nominations are finalized.			
ALL	1g		Review and improve Landscape Project species habitat models as new land use/land cover data and data on species habitat requirements are available and provide technical assistance and promote use of Landscape Project mapping in state land-use regulation, municipal planning, land acquisition priorities, and development of management strategies for permanently protected lands.			**Priority**
N, C, S	1h		Incorporate all baseline data for endangered, threatened, and special concern wildlife on permanently protected natural lands into Landscape Project and Biotics database.			
S	1i		Develop and implement proactive species recovery plans for all endangered and threatened species in this zone. Implement innovative and proactive habitat conservation plans to meet and maintain recovery goals.			**Priority**
RB, C	1j		Study songbird migration and develop appropriate management strategies for important stopover areas including collaboration with surrounding private landowners.			

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers	Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
1-CONT'D	**CONT'D: Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and nongame species and species of conservation concern.**				
N, C, & S	**1k**	Collaborate with local NGOs to carry out wildlife surveys including birds and invertebrates and conduct demographic studies (productivity, survival, dispersal) of priority species to provide information needed for determining causes of population declines and understanding metapopulation dynamics.			**Priority**
N, RB, & S	**1L**	Act to protect, maintain, and/or restore habitat as appropriate for bald eagles, ospreys (S only), and peregrine falcons.			
N, S	**1m**	Identify and protect coldwater fish species' habitats and ecosystems.			
2	**Protect water quality and the availability of wetland habitats.**				
ALL	**2a**	Maintain optimal buffers around wetlands, riparian and floodplain areas and minimize destruction. Encourage native plantings to stabilize stream banks and prevent erosion.	ENSP needs to clarify that this action pertains to wetlands regulations.	ENSP changed "stream banks" to "wetland banks or buffers" to clarify this action focuses on wetlands.	**Priority**
N, RB, S	**2b**	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts, protect known breeding sites from chemical contamination, siltation, eutrophication, and other forms of pollution/contamination that could directly harm species or their food supply (including birds, amphibians, and invertebrates).	Can actions 2a and 2b be combined?	No, 2a focuses on wetlands, 2b focuses on streams and riparian areas.	**Priority**
S	**2c**	Seek appropriate classifications for stream segments based on IBI results; some may result in upgrades of stream classification to Category 1.			
ALL	**2d**	Identify threats to vernal pool-dependent amphibians, reptiles and invertebrates.	ENSP needs to decide if this is a water quality action (1c-14) OR a habitat action - for placement and prioritization purpose only.	ENSP decided this action is focused on the habitat surrounding pools and is not a water quality focused action, therefore is found under 1c-14 (habitat-focused goal).	
3	**Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.**				
ALL	**3a**	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through surveys and public participation. Develop and implement invasive species management strategies in critical wildlife habitats.	This action should focus on creating a priority system for identifying the areas or sites where invasive species exist and management strategies should be focused. The second statement should be deleted from here and considered part of action 3c.	This action was revised and language added: "Identifying areas where invasive…established…through the creation of a system for reporting and qualifying new locations of invasive species."	**Priority**
ALL	**3b**	Work with land management agencies to monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the Asian longhorned beetle and gypsy moth. Collaborate on appropriate control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations.			
ALL	**3c**	Work with public and private landowners to employ physical, chemical or biological control measures, or a combination of these, in areas that are identified as providing critical habitat for endangered, threatened or priority wildlife species and are being threatened by invasive no indigenous plants. Control measures often cause soil disturbance that increases the chance of invasion by the same or other non-indigenous plants.	Incorporate second sentence from 3a and add or incorporate the statement from 3g to the end of this statement.	Incorporated second sentence from 3a. ENSP did not incorporate 3g into this action as it would basically "waters down" this action.	**Priority**
ALL	**3d**	Select and manage woodlots to maintain dead trees, reduce understory, and thin tree stands for open-woodland species and cavity-nesters such as red-headed woodpeckers and nightjars.		This action should have been placed under the habitat goal (1). It has been corrected within the Wildlife Action Plan.	

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers	Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
3-CONT'D	(CONT'D) Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.				
ALL	3e	Monitor forest regeneration via a system of exclosures (vegetative plots) throughout critical habitats on state lands to evaluate habitat health in response to changing deer densities. Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration is possible and to enhance forest health and biodiversity. Develop and implement, through regulations or legislation, programs that require farmers to achieve deer management goals, including harvest quotas, to obtain farm tax assessment or to qualify for farmland preservation programs.	Recommend a potential word change to, "...critical habitats on public lands to evaluate..." and "...programs that require owners to achieve deer..." Also recommend changing "farmers" to "landowners." There is a concern that this action will be tied to the use of exclosures which can be costly and the idea of this added cost could stall the effort. When available, we should use floristic quality assessment and plant stewardship index (currently only available for parts of the Piedmont Plains Region).	ENSP reworded this action to, "Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment should be required to achieve deer management goals, including harvest quotas, in order to obtain farm tax assessment or to qualify for farmland preservation programs."	**Priority**
ALL	3f	Request permission from private landowners (both those who allow hunting and do not allow hunting) to establish vegetation monitoring plots. This will allow greater surveillance of deer impacts on private lands, provide landowners direct information about the health of their land, and provide greater data input into the deer harvest formula.			
N, C, S	3g	Select and manage woodlots to maintain structural forest diversity, esp. shrub understory for forest passerines (Kentucky warblers, Louisiana waterthrushes, wood thrushes) and priority reptiles, amphibians, and invertebrate species.	Incorporate this action into action 3c.	Did not incorporate this action with action 3c as this action (3g) was incorrectly placed under this goal and should have been under the habitat goal (1). In addition, action 3g is focused on specific habitat types and species.	
N & S	3h	Support projects to eliminate aggressive invasive plant species found on private and public natural lands in wet meadow, marsh, and emergent wetland habitats and assess effectiveness of management techniques of invasive species removal on private and public lands.	Combine actions 3h and 3i. Add rivers and streams to the action. How are we addressing other aquatic habitats (e.g., lakes and ponds)??? Mussels need to be addressed.	Combined actions 3h and 3i and revised text to include "aquatic habitats" and specifically identified mussels and their associated habitats for protection and management.	**Priority**
C & S	3i	Implement management strategy to eliminate aquatic invasive species in sensitive or important habitats containing listed freshwater mussels.			
4	Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species.				
ALL	4a	Acquire data in areas where species data and monitoring gaps exist. (Gaps to be identified through Landscape Map.)			**Priority**
C	4b	Conduct searches for triangle floaters, frosted elfins, Henslow's sparrows, long-tailed salamanders, eastern mud salamanders, queen snakes, silver-bordered fritillaries, clubtail dragonflies, scarlet bluets, and pink streaks.			
S	4c	Conduct surveys in Delaware River tributaries and in suitable, previously unsurveyed areas to determine if listed or special concern freshwater mussel species are present and map distribution of eastern pondmussels, tidewater muckets and yellow lampmussels to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations.			**Priority**
C & S	4d	Conduct surveys to find more information about the species and management requirements of rails and sedge wrens.			

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers	Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
4-CONT'D	**CONT'D: Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species.**				
ALL	4e	Through national, standardized survey protocols, utilizing citizen scientists, continue long-term monitoring and survey to collect baseline data (protected lands) of raptors, songbirds, reptiles and amphibians, colonial waterbirds, and aquatic invertebrate populations, and incorporate new information into Landscape Project mapping. Promote coordination of species monitoring and management efforts among conservation groups and state agencies in New Jersey.			**Priority**
RB	4f	Survey all salt marshes for breeding seaside and saltmarsh sharp-tailed sparrows.			
S	4g	Survey suitable habitats to determine distribution and trends of the shortnose sturgeon, dwarf wedgemussel, blue-spotted salamander, queen snake, bronze copper, frosted elfin, bobcat and other species with little known distribution patterns in this zone.			**Priority**
C	4h	Survey suitable habitats to determine distribution of barn owls, American kestrels, northern copperheads, and other wildlife of greatest conservation need and establish baseline information for monitoring.			**Priority**
N	4i	Identify key breeding locations for cliff swallows and common nighthawks for immediate conservation efforts.	Revise all text regarding "wild trout" to "native wild trout."	All text revised in this and other landscape regions.	
N & S	4j	Routinely monitor fish populations, including wild trout, in order to keep management strategies current, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. Monitor and develop management strategies for coldwater fisheries in large reservoirs.			
RB	4k	Identify and survey suitable habitat for northern spring salamanders, northern copperheads, and checkered whites. Research survey methods and develop a plan for the survey and long-term monitoring of colonial waterbird populations on the Raritan Bay coast and songbird populations throughout the zone.			
N	4l	Develop protocol to monitor abundance and distribution of colonial waterbirds north of the Coastal Landscape. Identify and inventory coastal and inland wetlands important for colonial waterbirds, long-legged waders, marsh-nesting birds, and waterfowl for which we have little data; incorporate these data and other data from the area into Landscape Project mapping.			**Priority**
S	4m	Determine carrying capacity of freshwater tidal marshes for spring staging waterfowl of conservation concern.			
N	4n	Identify and inventory areas suitable for American burying beetles, Harris' checkerspots, ringed boghaunters, long-tailed salamanders, saltmarsh sharp-tailed sparrows, seaside sparrows, and purple finches.			
ALL	4o	RB/C/S: Conduct field sampling for listed or special concern species at areas indicated by Fish Track Database queries. N: Routinely monitor fish populations, including wild trout, in order to keep management strategies current, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources.			
N, C, S	4p	Survey suitable habitats to determine distribution and trends of grassland and early-succession dependent species annually.			**Priority**
ALL	4q	Identify and research water quality parameters for various species' populations including but not limited to bald eagle, wood turtle, and special concern amphibian populations.	Can 4q and 4t be combined?	No, 4q is focused on identifying what the species need, while 4t is focused on evaluating a management practice/ strategy.	**Priority**
ALL	4r	Long-term acoustical sampling of forest dwelling bats should be conducted to determine population trends and species response to changes in habitats.	Can 4r be eliminated and incorporated into bat goal (8)?	Yes, all of the bat actions will be integrated under the appropriate goals (1, 4, or 5).	**Priority**
N	4s	Systematically survey the Northern Piedmont Plains zone, particularly Teterboro Airport, Hackensack Meadowlands, Great Swamp NWR, and areas in Piscataway, South Plainfield, Warren, Harding, Hanover, West Caldwell, and Bergen County for songbirds, raptors, colonial waterbirds, grassland/open-field and wetland butterflies, and waterfowl.			

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers	Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
4-CONT'D	**CONT'D: Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species.**				
ALL	4t	Research and evaluate effectiveness of water quality management practices on water-dependent species (e.g. marsh nesting birds, eastern tiger salamanders, bog turtles, and aquatic invertebrates).	Can 4q and 4t be combined?	No, 4q is focused on identifying what the species need, while 4t is focused on evaluating a management practice/ strategy.	**Priority**
5	**Prevent, stabilize and/or reverse declines of endangered, threatened, and special concern species.**				
ALL	5a	DFW to give priority attention to species of greatest conservation need in planning or implementing any response to any exotic pathogen introduction or incident.	There is confusion about this action as it would seem the Dept. of Agriculture would take lead on this issue, but in this case, DFW is "leading" the process of assigning priority to areas and then reach out to Dept. of Agriculture. This needs clarification.	Action has been revised for clarification: "DFW will collaborate with USDA to identify and prioritize, based upon species of greatest conservation need, areas where rapid response to an exotic pathogen introduction or incident is needed."	
ALL	5b	Research effects of parasites and diseases on special concern fish species' populations.			
N, C, S	5c	Identify areas with known wildlife mortality issues (breeding amphibians) and high densities of wildlife prone to road mortality (snakes, turtles, large mammals).			**Priority**
N, C	5d	Use baseline and population trend data to develop management strategies for endangered, threatened and special concern wildlife on permanently protected natural lands.			**Priority**
N, C, S	5e	Maintain and enhance reptile and amphibian populations, particularly those that are endangered because of illegal collection for the pet trade (bog and wood turtles, pine and corn snakes) and those populations most susceptible to road mortality (known box turtle breeding locations near roads). Secure bog turtle and wood turtle populations threatened by collection; identify sources of funding for enforcement of endangered species laws and protection of wildlife from illegal collection.			**Priority**
N	5f	Compile better life history information on urban species, such as the kinds of nest predators and levels of nest depredation, breeding longevity and reproductive effort over time, preferred nesting requirements, fidelity to breeding and wintering sites, and better assessment of migration routes and destinations.			**Priority**
N	5g	Continue research and monitoring of Allegheny woodrat populations in the Palisades, including control of impact from disease.			**Priority**
N	5h	Develop an appropriate survey method for tracking populations of chimney swifts and common nighthawks and conduct a thorough status assessment of these species.			**Priority**
ALL	5i	Develop and implement management actions to enhance populations of special concern and rare fish, especially the state's valuable wild coldwater fisheries in large reservoirs.			
N	5j	Identify threats to groundwater-fed pools to protect vernal pool invertebrates and amphibians and groundwater recharge areas for blue-spotted salamander breeding sites.			
N & S - EXPAND TO ALL ZONES	5k	Prevent fish declines by utilizing the Delphi process initiated by the Division of Fish and Wildlife in 2003 to determine fish species that may warrant "special concern status."			**Priority**
RB	5l	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational water-users and cooperation with private landowners.			
RB	5m	Continue to monitor reproductive success of eagles, osprey, peregrine falcons and northern harriers and protect nesting areas from human disturbance.			
RB	5n	Assess impacts of coastal and offshore wind turbines on breeding, migrating, and wintering bird and bat populations.			
S	5o	Assess impact of aquatic invasive species on freshwater mussels. Implement management strategy to eliminate aquatic invasive species in sensitive or important habitats containing listed freshwater mussels.			
RB	5p	Determine habitat needs, limiting factors, and contaminant burdens in wintering greater and lesser scaup and sea ducks of conservation concern.			
RB	5q	Protect all remaining habitat for saltmarsh sharp-tailed sparrows (high marsh with buffer, stable water levels) and identify areas for restoration of snowy egret, saltmarsh sharp-tailed sparrow, seaside sparrow, and rail populations.			**Priority**

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers	Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
5-CONT'D	**CONT'D: Prevent, stabilize and/or reverse declines of endangered, threatened, and special concern species.**				
ALL	5r	(N, RB, C): Work with managers to manage impoundments to benefit bitterns, rails, ducks and some invertebrates by providing suitable foraging habitat and encouraging dense stands of emergent vegetation for nesting. (RB, S): Study how land use practices such as ditching, impounding, dredging, open marsh water management, burning, and marsh restoration impact species in this suite.			**Priority**
N, C, S	5s	Encourage widening of stream flow under roadways (using multiple culverts or a more "natural" stream-like set-up (i.e. gravel bed with concrete sides).	There is a concern about "widening" stream flows with regards to potential flood issues further down stream.	Action revised: "Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. "	
C	5t	Investigate causes for decline and develop models based on habitat requirements of American kestrel and barn owl; identify most effective methods to restore and enhance habitat and provide nest cavities (standing dead biomass and nest boxes).			**Priority**
RB & S	5u	Study how land use practices such as ditching, impounding, dredging, open marsh water management, burning, and marsh restoration impac species in this suite.	ELIMINATE…EXACT SENTENCE REPEATED IN 5R		
ALL	5v	Seek Category One classifications in stream segments with high levels of biological integrity based on fish assemblages and with listed freshwater mussels. Protect water quality in occupied waterways to preserve populations of nongame fish species.			**Priority**
6	**Assess large-scale habitat change (every five to 10 years).**				
ALL	6a	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years.	6b can't be performed without 6a.	Actions 6a and 6b have been combined.	**Priority**
ALL	6b	Perform critical habitat change analysis to assess trend in habitat loss and conversion.			
7	**Protect and enhance important and unique natural communities.**				
ALL	7a	Work with state agencies and local governments to map significant natural communities in Piedmont Plains.			
N & S (specific)	7b	Continue to support the protection of Palisades Interstate Park and the globally rare species that occur there, the hardwood swamp natural community and federal threatened plant species at Glassboro Woods in Glassboro WMA, the large wetland complex of the Great Swamp National Wildlife Refuge, the tidal brackish marsh and river drainages of Mannington Meadows Macrosite, and the protection of tidal freshwater marshes along the Delaware River.	Should we make a reference to woodrat habitat here?	No, we would have to identify species for all identified areas.	**Priority**
ALL	7c	Identify, protect, and enhance critical migratory stopover habitats such as Glassboro WMA, Great Swamp NWR, Hackensack Meadowlands, Sourland Mountains, Princeton Woods, Assunpink WMA, Atlantic Highlands, Manasquan Naval Depot, and Tom's River.	There is confusion between 7c and 7d, having to choose between different areas. Action 7c focuses on migratory habitats and 7d on unique habitats for other reasons.	Actions have been revised to include the phrase "including by not limited to" so there is potential for additional unique communities to be addressed.	**Priority**

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers	Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
7-CONT'D	**(CONT'D) Protect and enhance important and unique natural communities.**				
ALL	7d	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to protect and enhance the high quality floodplain forest natural community at Walnford Floodplain, the tidal freshwater swamp and sandy bluff natural community and rare plant species at the Sout River Marshes, the traprock glade natural community and endangered plant species at Chimney Rock, the pine barren upland/wetland complex and rare plant species at Shark River Station, the open farmlands at East Amwell Grasslands Macrosite, the natural community and endangered plant species at Seeleys Pond, the hardwood swamp natural community and federal threatened plant species at United States Ave, Hidden Lake, Toms Branch, and Campus Swamp sites, the globally imperiled natural community at the Preakness Mountain macrosite and the forest at Sourland Mountain Preserve.			
8	**Identify and protect summer habitat for Indiana bats and other forest-dwelling bat species.**				
ALL	8a	Conduct statewide acoustical sampling to determine distribution, range, and habitat use of summer bats.			
ALL	8b	Continue volunteer-based summer bat concentration surveys to locate important maternity sites and determine roost characteristics. Trap and band bats at summer concentration sites to identify bat species; apply plastic colored bands to Indiana bats to aid in recognition during hibernation surveys.	Can we combine 8b and 8c?	No, 8b focuses on all bat species through the volunteer-based roost sites' counts and specifically Indiana bat with regards to trapping. Action 8c focuses on Indiana bat only. We have revised the text in both 8b and 8c to clarify that banding and telemetry activities are focused on Indiana bats only.	**Priority**
ALL	8c	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for maternity colonies.	Can we combine 8b and 8c?		**Priority**
ALL	8d	Evaluate and assess impacts of wind turbines to populations of bats.			
ALL	8e	Develop a GIS model of Indiana bat habitat to incorporate into the Landscape Project. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices).			**Priority**
ALL	8f	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999).			
9	**Protect, enhance, and restore coldwater fish habitat and ecosystems. ---HABITAT FOCUS**		Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	
N & S	9a	Continue to classify waters according to their suitability for trout, and provide recommendations for surface water classification changes to the Department of Environmental Protection.	Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	
N & S	9b	Develop and implement a habitat improvement and restoration program.	Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	**Priority**
N & S	9c	Monitor changes in water quality on specific waterways where summer trout habitat may be in jeopardy due to declining water quality.	Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	**Priority**
10	**Conserve and enhance wild trout populations at optimal levels. ---POPULATION FOCUS**		Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	
N & S	10a	Routinely monitor wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources.	Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	**Priority**
N & S	10b	Evaluate current management practices that may negatively impact wild trout populations.	Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	
N & S	10c	Develop management strategies to assure the protection of NJ's valuable wild coldwater fisheries populations.	Revise all text regarding "wild trout" to "native wild trout." Also, reword…remove/revise the term "valuable"	Revised as recommended.	**Priority**
N & S	10d	Protect wild trout populations through the use of established fishing regulations.	Revise all text regarding "wild trout" to "native wild trout."	Revised as recommended.	
11	**Prevent illegal collection of rare reptiles and amphibian.**				
ALL	11a	Notify the NJ Division of Fish and Wildlife's Bureau of Law Enforcement of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles, corn and pine snakes), persecution (snakes) (timber rattlesnakes), and human disturbance (off-road-vehicles).	Add USFWS Special Agents to identified list of partners.	Revised as recommended.	

Goals (1-12) & the Conservation Zone(s) addressing the action.	Conservation Actions' Identification Numbers	Conservation Actions	Summarization of meeting notes obtained at Piedmont Plains Regional Landscape Stakeholders' meeting, Sept. 7, 2006	ENSP response (Note: In addition to responding to the comments/ recommendations, ENSP has revised all actions to include measurable outcomes.)	PRIORITY ACTIONS
11-CONT'D	**(CONT'D) Prevent illegal collection of rare reptiles and amphibian.**				
ALL	11b	Recruit and educate local law enforcement of endangered species laws. Develop a partnership between them and the NJ Division of Fish and Wildlife's Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles, corn and pine snakes), persecution (timber rattlesnakes and other native snake species), and human disturbance (off-road-vehicles).			**Priority**
12	**Promote public education, awareness, wildlife conservation, and participation in habitat restoration efforts on private land.**				
ALL	12a	Educate homeowners on proper eviction of house-dwelling bat populations and importance of providing alternative roosting structures for maternity colonies.			
ALL	12b	Develop public education materials regarding the most aggressive, invasive non-indigenous plants and fish to involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control.	Can we combine 12b and 12c? We should include insects such as Asian long-horned beetle.	No, there are two "tools" identified in these actions that involve the public. The first is to "identify" the problems, the second is to "not be a part of the problem." ENSP has kept these two actions separate. In addition, action 12c will not include regulation or legislation regarding invasives as this is more appropriate and exists as an action within the state-level section of the Wildlife Action Plan.	
ALL	12c	Prevent establishment of non-indigenous species: Encourage native plant use in landscaping through public awareness and landscaping companies as introduced ornamental plants are a major source of non-indigenous species that invade natural plant communities.	Can we combine 12b and 12c? We should revise to include the implementation of statewide regulations or legislation on the sale of invasive species.		**Priority**
ALL	12d	Develop and maintain educational materials, and viewing and recreational opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state and non-governmental organization partners.			**Priority**
ALL	12e	Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs. Educate public about keeping cats indoors.			**Priority**
ALL	12f	Develop and maintain educational materials about nongame and coldwater fish for dissemination to the public.			
N,C, RB, S	12g	Engage landowners in protection efforts for endangered species through programs like the Citizen Science program. Collaborate with partners to develop innovative outreach educational programs to protect these important habitats. Promote incentive programs to encourage agricultural landowners to actively manage for grassland dependent species.			**Priority**
C & RB	12h	Educate public on threats to wildlife, and develop management guidelines for private landowners with significant bald eagle, wood turtle, freshwater wetland bird, grassland bird, woodland raptor, or scrub-shrub/open field bird populations.			**Priority**
N	12i	Educate homeowners about habitat requirements of chimney swifts and discourage use of chimney caps where possible.			
S	12j	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna.			

Attachment G: Report on Skylands Regional Landscape Stakeholder Implementation Meeting (January 10, 2007)

Summary Report on the
Wildlife Action Plan
Skylands Implementation Meeting

Environmental Law Institute
to
New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program

January 2007

Executive Summary

In February 2006, the Conserve Wildlife Foundation of New Jersey, in partnership with the New Jersey Department of Environmental Protection's Division of Fish and Wildlife, convened over 40 stakeholders from organizations that focus on statewide issues. The first statewide stakeholders' meeting was held at Duke Farms in Hillsboro, New Jersey. Their role was to discuss and select priority state-level goals from those identified in the New Jersey Wildlife Action Plan. Stakeholders identified 13 priority state-level goals, which can be found in Attachment A.

The second statewide Wildlife Action Plan Stakeholder Meeting was held on Thursday, April 6, 2006, at Duke Farms. The primary goal of the meeting was to solicit stakeholder input into prioritizing state-level conservation strategies (actions) associated with the 13 priority state-level conservation goals identified at the first meeting. Participants from organizations that focus on statewide issues discussed and debated the state-level conservation strategies and provided their input on refining and prioritizing them. Seventy-two conservation strategies were selected as priorities. These can also be found in Attachment A.

On Wednesday, January 10, 2007, local stakeholders associated with the Skylands Regional Landscape convened for the Skylands Wildlife Action Plan Implementation Meeting held at the Pequest Trout Hatchery and Natural Resource Education Center in Oxford, New Jersey (Attachment B). This was the second of five regional landscape meetings to be held throughout the state. The goal of this meeting was to identify a set of priority conservation actions to drive implementation of the state's Wildlife Action Plan in the Skylands Regional Landscape.

Background

On January 10, 2007, the Conserve Wildlife Foundation of New Jersey (CWF) convened the Skylands Wildlife Action Plan Implementation Meeting in partnership with the New Jersey Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW). The meeting was held at the Pequest Trout Hatchery and Natural Resource Education Center in Oxford, New Jersey.

The meeting was the second of five Wildlife Action Plan landscape-level prioritization meetings. The thirty-four (34) stakeholders who attended the meeting worked to identify a subset of fifty (50) priority conservation actions among the one hundred four (104) conservation actions* identified in Skylands portion of the New Jersey Wildlife Action Plan. These fifty (50) priority conservation actions will be used by the DFW and its conservation partners to guide conservation efforts and resources toward implementing the state's Wildlife Action Plan in the Skylands Regional Landscape.

The New Jersey Wildlife Action Plan (Plan) is a proactive plan to conserve wildlife species before they become more rare and more costly to protect. The multi-scale plan identifies threats, conservation goals, and conservation actions at the state, landscape (5 regions; ocean is currently part of the Atlantic Coastal Regional Landscape), and sub-regional levels (identified as conservation zones within New Jersey's Plan). New Jersey submitted its Plan to the U.S. Fish and Wildlife Service on October 1, 2005, submitted its revised plan on July 26, 2006, and received final approval from the Service in September 2006.

The New Jersey Wildlife Action Plan is a living document and will undergo periodic revisions per comments and recommendations received by the public, through the regional stakeholder meetings, and as part of the adaptive management strategy outlined within the Plan. Digital copies of the Plan are available at the Division of Fish and Wildlife's Web site: www.state.nj.us/dep/fgw/ensp/waphome.htm

Summary of Skylands Implementation Meeting

The objectives of the Skylands Implementation Meeting were to:

- Provide stakeholders with a review the Skylands Regional Landscape conservation goals and actions;
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions; and
- Seek stakeholder input on and identify fifty (50) specific and broad-based* priority conservation actions for the Skylands Regional Landscape.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

The Skylands Regional Landscape section of the New Jersey Wildlife Action Plan includes a number of goals, which focus on issues such as habitat conservation and protection, the conservation of populations of species of greatest conservation need, water quality, and public education and viewing opportunities. Each of the goals has a varying number of conservation actions associated with them that were developed to address the specific needs of each conservation zone (sub-regional level) within the Skylands Regional Landscape. The implementation meeting was designed to:

- Provide local leaders and stakeholders with background on the objectives of the Wildlife Action Plan and its implementation;
- Provide a foundation for potential partnerships to implement the Wildlife Action Plan; and
- Seek stakeholder input to determine priority conservation actions for the Skylands Regional Landscape.

In preparation for the working meeting, DFW's Endangered and Nongame Species Program (ENSP) staff reviewed the conservation actions associated with the Skylands Regional Landscape and indicated which actions the ENSP considered priorities. The invited stakeholders were asked to review *in advance* the goals and actions associated with the Skylands Region, as well as those actions pre-selected by the ENSP. The majority of the day was devoted to further discussion and clarification of conservation actions and final prioritization of the actions.

Introductory Sessions

Dave Jenkins, Chief of ENSP, welcomed stakeholders and provided attendees with background on the purpose of the New Jersey Wildlife Action Plan and its basis in the Landscape Project. Jenkins stated that the plan is designed to be a blueprint for wildlife conservation for the full array of traditional and non-traditional conservation partners in the state, and is not solely for the Division of Fish and Wildlife. His presentation focused on the conservation potential in New Jersey and he discussed the role and importance of partnerships in achieving conservation objectives in New Jersey.

The meeting began with a presentation by Christine Danis, Principal Planner for the New Jersey Highlands Council. Ms. Danis discussed the Highlands Regional Master Plan, for which the Council is accepting comments through March 2, 2007. The draft Regional Master Plan was released on November 30 for public comment. The Highlands Regional Master Plan is a comprehensive, science-based plan, designed to safeguard New Jersey's most significant source of drinking water.

Jessica Wilkinson, a senior policy analyst with the Environmental Law Institute, served as the facilitator, gave an overview of the meeting objectives and agenda, and asked

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each participant to introduce themselves.

Mick Valent, a principal zoologist with the ENSP responsible for the Skylands Regional Landscape, discussed the threats to the Skylands Landscape habitat and wildlife and DEP's role in conservation in the region.

Kris Schantz, a senior biologist with ENSP and coordinator of the New Jersey Wildlife Action Plan, gave a summary of the priority actions selected by the ENSP in advance of the meeting. She stated that for the Skylands Region, the plan includes 13 broad-based* conservation goals and 104 specific and broad-based* conservation actions associated with those goals.

Facilitated Discussion

The majority of the remainder of the day was devoted to a discussion of the conservation actions associated with each of the region's conservation goals. Wilkinson led the participants through a discussion of each of the goals in turn. She asked participants to offer their comments on which of the conservation actions they considered to be of particular importance and which they felt were of lesser importance. In addition, participants were able to seek clarification on any of the actions that were unclear and add back in for further consideration actions not identified by the ENSP as priorities.

After a thorough discussion of the actions associated with each goal, the participants were asked to select a predetermined number of conservation actions they considered the highest priority for implementation within that goal. The number of actions participants were asked to select for each goal are found in Chart 1 below. In addition, ENSP staff assured the stakeholders that the potential edits to the actions discussed at the meeting would be reviewed and incorporated where feasible, and the actions would be revised to include measurable outcomes. The results of the participants' selection and the original actions with notes of revisions incorporated into the Plan can be found in Attachment D.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

	Number of conservation actions per goal
Goal 1	9
Goal 2	2
Goal 3	3
Goal 4	5
Goal 5	11
Goal 6	n/a
Goal 7	2
Goal 8	4
Goal 9	2
Goal 10	2
Goal 11	2
Goal 12	1
Goal 13	6

Chart 1: Number of conservation actions participants were asked to select for each of the conservation goals.

Concluding Presentations

Kris Schantz gave a brief presentation on partnership ideas and ongoing projects. She requested that stakeholders submit a list of current and proposed projects for their organizations in an effort to develop future partnerships and work to integrate Plan objectives into projects throughout the region.

Dave Jenkins gave closing remarks and thanked the participants for their time and contributions. He informed participants that actions not selected as priority will remain in the Plan as an integral part of the Plan's success to achieve the desired objectives, but that the priority list helps provide guidance to our stakeholders when allocating limited resources for future conservation projects.

ATTACHMENTS:

A: Priority State-level Conservation Goals and Strategies (Actions)
B: List of Skylands Regional Landscape Invitees and Attendees
C: Skylands Wildlife Action Plan Stakeholder Meeting Final Agenda
D: Skylands Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Attachment A: Priority State-level Conservation Goals and Strategies (Actions)

New Jersey Wildlife Action Plan
Priority State-level Goals and Strategies

Below you will find thirteen priority state-level goals identified at the First Wildlife Action Plan Stakeholder Meeting held on February 23, 2006, and the associated priority conservation strategies identified at the Second Wildlife Action Plan Stakeholder Meeting held on April 6, 2006. The goals have been categorized by the main topic and, where appropriate, the sub-topic as identified within the New Jersey Wildlife Action Plan. The goals and associated priorities have been arranged in categories and key words and concepts appear in bold to provide focus for the array of New Jersey partners in conservation, land managers and stewards, outreach initiatives, and residents interested in managing their lands to support native wildlife.

All of the goals and strategies have integrated public education and outreach and are to be implemented with an active adapted management strategy. The New Jersey Division of Fish and Wildlife hopes to receive continual feedback on implementation successes and failures that our state can integrate into the Wildlife Action Plan and implementation process.

Addressing National, Interstate, and Statewide Threats

Suburban sprawl and large-acre zoning

Goal: Identify and **protect** breeding, migration, and wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.

1. NJ Division of Fish and Wildlife (DFW) will collaborate with municipal and county planners to identify critical wildlife habitats for sensitive species and natural systems within their borders.
2. Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.
3. Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition, and land planning at all levels of government and non-government organizations.
4. Mitigate impacts of existing development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
5. Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
6. Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available.
7. DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include

clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.

8. Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
9. Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.

Goal: Maintain **connectivity of habitats** at the landscape scale.

1. Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
2. DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
3. Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
4. Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

Goal: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.

1. Reduce regulatory impediments to restoration and enhancement activities.
2. Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
3. Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
4. Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
5. Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
6. Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.

7. Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by GIS analysis.
8. Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
9. Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.

Goal: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.

1. Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
2. Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
3. Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
4. Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies, and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:.
    a. A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations.
    b. A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    c. A model ordinance for regulating feeding of wildlife.
    d. A model pet licensing ordinance.
    e. Mapping of colonies to evaluate impact on species of conservation concern.
5. Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
6. Create and implement a system for reporting and qualifying new locations of priority invasive species.
7. Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
8. Create implementation plan for Invasive Species Task Force recommendations when completed.

Unsustainable Land Management Practices on both Private and Conserved Lands and Water

Goal: Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

1. Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
2. Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
3. Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
4. Through surveys, increase the number of Category 1 streams justified by endangered and threatened species data.
5. Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using GIS and principles of landscape ecology as the foundation.

Direct Human Impacts on Native Wildlife and Ecosystem Health

Goal: Identify, protect, and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

1. Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
2. Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
3. Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
4. Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.

Development and Long-term Monitoring

Goal: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases to determine the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.

1. Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following:
   - o Breeding Bird Atlas
   - o Breeding Bird Survey
   - o Delaware Bay Migratory Shorebird Survey
   - o Bald Eagle Midwinter Survey
   - o Herptile Atlas
   - o Calling Amphibian Monitoring Program
   - o Fish Monitoring-Streams and Ponds
   - o Freshwater Mussel Atlas
   - o Mid-Winter Waterfowl Survey
   - o Atlantic Flyway Breeding Waterfowl Survey
   - o DFW Bobwhite Call-Count Survey
   - o Woodcock Call-Count Survey
   - o DFW Beaver-Otter Survey
   - o Migratory Game Bird Banding Programs
   - o Colonial Waterbird Survey
   - o Beach Nesting Bird Survey
   - o Site-specific Fish Monitoring Programs
2. Complete the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.
3. Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
4. Measure the enrollment acreage and effectiveness of backyard habitat management.
5. Through GIS, track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitor each site and evaluate the effectiveness of the management technique.
6. Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.

High Deer Densities

Goal: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific deer densities**.

1. Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
2. Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting,

Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.

3. Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
4. Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.
5. Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
6. Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.

Contaminants

Goal: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination**.

1. Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
2. Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
3. Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

Motorized Recreation Vehicles

Goal: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use**.

1. Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.

2. Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
3. Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
4. Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
5. Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.

Endangered, Threatened and Rare Wildlife

Goal: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protection of critical habitat, and habitat restoration and enhancement.

1. Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
2. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
3. Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.

Migratory Stopover and Important Bird Areas Planning

Goal: Identify, monitor, and **conserve key migratory corridors and stopover locations** for migratory birds.

1. Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
2. Annually monitor shorebird populations along the Delaware Bayshore stopover.
3. Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.

4. Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
5. Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers, and other "human-made" tall structures.
6. Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.

Review of Wildlife Action Plan

Goal: Ensure that **conservation activities** of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan (Plan).

1. The most current version of the Plan will be continually available for review on the Division of Fish and Wildlife's Web site with an open invitation to submit comments.
2. Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the Endangered and Nongame Species Advisory Committee (ENSAC), and a wildlife summit in which adaptive management will be built into the revision.
3. DFW will work with federal, state, county, municipal, and private (NGOs) land managers to incorporate the goals and strategies of the Plan into current management plans by the first formal review in 2011.
4. Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the ENSAC, the Fish and Game Council, and the Marine Fisheries Council.

Attachment B: List of Skylands Regional Landscape Invitees and Attendees

ATTACHMENT B

Skylands Regional Landscape Stakeholder Meeting: Wildlife Action Plan

List of Attendees

First name	Last name	Organization	Invited	Attended
Naomi	Avissar	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Frank	Banisch	Banisch Associates	X	X
Sandy	Batty	ANJEC	X	
Barbara	Brummer	The Nature Conservancy	X	X
Janet	Bucknall	USDA APHIS Wildlife Services	X	X
Joanna	Burger	ENSP Advisory Committee	X	X
Kathleen	Caren	Passaic County Planning Dept.	X	X
Dave	Chanda	NJDEP-Division of Fish and Wildlife, Director	X	X
Tim	Cussen	NJDEP-Division of Fish and Wildlife, Law Enforcement	X	X
Christine	Danis	Highlands Council	X	X
Emile	DeVito	The NJ Conservation Foundation-Bamboo Brook	X	
Mandy	Dey	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Donna	Drewes	Municipal Land Use Center	X	
Miriam	Dunne	NJDEP-Division of Fish and Wildlife, BLM	X	X
Susan	Elbin	Wildlife Trust	X	
Troy	Ettel	NJ Audubon Society	X	X
Ed	Henry	Wallkill River and Shawangunk Grasslands NWRs	X	X
Larry	Hilaire	National Park Service Delaware Water Gap National Recreation Area	X	X
George	Howard	NJ State Federation of Sportsmen's Clubs	X	
Dave	Jenkins	NJDEP-Division of Fish and Wildlife, ENSP, Acting Chief	X	X
Robert	Jennings	Morris County Park Commission	X	X
Elizabeth	Johnson	American Museum of Natural History	X	X
Patricia	Kallesser	Voorhees and Hacklebarney State Parks	X	X
Bill	Koch	Great Swamp NWR and Wallkill	X	X
Charles	Kontos		X	
Wayne	Martin	NJ Foresters	X	X
Bill	O'Hearn	NY-NJ Trails Conference	X	X
Eric	Olsen	The Nature Conservancy	X	X
Robert	Olsen	NJDEP-Division of Fish and Wildlife, BLM	X	X

ATTACHMENT B (continued)

First name	Last name	Organization	Invited	Attended
John	Parke	NJ Audubon Society	X	X
Sharon	Petzinger	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Kris	Schantz	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Jeff	Schreiner	National Park Service Delaware Water Gap National Recreation Area	X	X
Gregory	Sipple	Warren County Planning Department	X	
Dan	Stotts	USFWS	X	X
Donna	Traylor	Sussex Co. Planning Office	X	
Mick	Valent	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Jessica	Wilkinson	Environmental Law Institute	X	X
Peter	Winkler	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Patrick	Woerner	Conserve Wildlife Foundation of NJ	X	X
Brad	Yucius	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Brian	Zarate	NJDEP-Division of Fish and Wildlife, ENSP	X	X

Attachment C: Skylands Wildlife Action Plan Stakeholder Meeting Final Agenda

ATTACHMENT C

CONSERVE WILDLIFE
FOUNDATION OF NEW JERSEY

Wildlife Action Plan
Skylands Landscape Implementation Meeting
Wednesday, January 10, 2007
9:00 a.m. to 4:30 p.m.

Meeting Objectives

- Review Skylands Landscape goals and conservation actions
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions
- Seek stakeholder input on selection of priority conservation actions

Meeting Agenda

8:30 - 9:00 a.m. Coffee

9:00 a.m. Welcome and Introduction to the New Jersey State Wildlife Action Plan
- Dave Jenkins, Chief, Endangered and Nongame Species Program Division of Fish and Wildlife, Department of Environmental Protection
- Questions and Answers (5 minutes)

9:35 a.m. Overview and Introductions
- Jessica Wilkinson, Environmental Law Institute

9:45 a.m. Threats to the Habitat and Wildlife of the Skylands Regional Landscape
- Mick Valent, Principal Zoologist, Endangered and Nongame Species Program

10:00 a.m Highlands Regional Master Plan
- Christine Danis, Principal Planner, NJ Highlands Council
- Questions and Answers (5 minutes)

10:20 a.m Summary of DFW-Selected High Priority Actions
- Kris Schantz, Senior Zoologist, Endangered and Nongame Species Program

10:30 a.m. Break

10:45 a.m. Facilitated Discussion of Priority Actions

12:00 – 1:00 pm Lunch

1:00 p.m. Facilitated Discussion of Priority Actions (continued)

2:50 p.m. Partnership Ideas and Ongoing Projects

- Kris Schantz, Senior Zoologist, Endangered and Nongame Species Program

3:00 p.m. Break

3:30 p.m Selection of Priority Actions

4:00 p.m. Wrap-Up & Next Steps

- Dave Jenkins, Chief, Endangered and Nongame Species Program Division of Fish and Wildlife, Department of Environmental Protection

Attachment D: Skylands Priority Conservation Actions
& Action-related Comments per the Stakeholders' Meeting

Goals (1-13)	Conservation Actions' Numbers		SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
1	**Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and species of conservation concern.**				
	1a	**Forest**			
		1a-1	Use GIS measures, other remote-sensing tools, and surveys to identify critical core forests (forest area >90 meters from the forest edge) and maintain species information in the Biotics database. Preserve and protect core forests through: • Regulations, land acquisition, and incentive programs for forest-dependent breeding species: forest-interior passerines and bobcats (³ 10 hectares or 24.7 acres of core forest), forest raptors (³ 100 hectares or 247 acres of contiguous forest), timber rattlesnakes (if unknown foraging habitat, a minimum of 1 ½ mile radius surrounding known den locations or 4,521 acres), and Indiana bats (³ 6.8 hectares or 17 acres of contiguous forest) per the Forest Management Guidelines for Species of Conservation Concern in New Jersey. • Preservation efforts focused on area- and disturbance-sensitive breeding species in core forests located at least 2,500 meters from major highways. • Prevention of activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). • Identification of habitats adjacent to core forests that can be preserved and/or managed to increase the total size of forest habitat. • Collaboration with land managers, forest stewards, and private landowners to implement best management practices.	***PRIORITY***	Revision includes: 1) Added "develop and implement" best management practices to last bullet.
		1a-2	Use GIS measures and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, northern goshawk, long-eared owl, barred owl), forest-interior songbirds (cerulean warbler, Louisiana waterthrush, Canada warbler, winter wren), bobcats, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management plans.	***PRIORITY***	Revision includes: 1) Revised "...forest management plans" to "…forest management and stewardship plans."
		1a-3	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g. woodland raptors, timber rattlesnakes, cerulean warblers and ruffed grouse and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large areas of mature forests with large trees, 80% canopy cover, and dense stands of coniferous and mixed forest with high foliage density that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and ridge-top forests for forest-interior passerines (old-growth forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature into an old-growth condition to create future barred owl and shouldered hawk habitat. • Canopy of 10-50% should be maintain at known timber rattlesnake dens and basking areas; foraging areas >50% canopy.	***PRIORITY***	The greatest concern within this action pertained to the use of particular terms (e.g., old growth, mature forests) in relation to NJ's forest structure. Revisions to this action include: 1) First bulleted item, revised "..mature forest..." to "...mature and near mature forests..." and revised "...dense stands of coniferous and mixed forest with high foliage density..." to "...an uneven age structure..."; 2) Second bulleted item, revised "...(old-growth forests with 65-85% canopy...)" to "... managing for mature forests with 65-85% canopy...)"; 3) Third bulleted item, revised "...allowed to mature into an old-growth condition to create..." to "... allowed to mature to create ...";
			• Take action to minimize loss of old-growth forest stands with large trees and large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management plans.		4) Fourth bulleted item, revisions addressed confusion regarding open areas within forests, added " (these limits are generally naturally-occurring due to rocky and talus substrates)" to the end of the statement; 5) Fifth bulleted item, revised "...old-growth forest stands..." to "...older forest stands..." An oversight in the February 16, 2007, version of the Wildlife Action Plan includes the fifth bulleted item showing the last phrase "…forest management plans," this will be revised to include "forest management and stewardship plans."
		1a-4	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where possible, enhance and restore forested habitat through afforestation and revegetation.	***PRIORITY***	

Goals (1-13)	Conservation Actions' Numbers		SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	1b	**Grassland and early-successional fields**			
		1b-1	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed through public education and incentive programs. Increase the number of acres converted from existing hay and/or row crops to warm season grass fields, where appropriate, using landowner incentive programs. Evaluate effectiveness of delayed mowing between warm season grass fields and cool season hay fields for grassland-dependent species including birds, invertebrates, reptiles, and amphibians. Research different management techniques to understand the appropriateness of prescribed burning, mowing, and other methods for maintaining suitable habitat for northeastern grassland birds and grassland dependent invertebrates.	***PRIORITY***	The greatest concern within this action pertained to the need for clarification of particular terms (e.g., early-successional grasslands, scrub-shrub) . To address this, the actions were not revised but rather descriptions were provided in the goal addressing such habitats. Revisions to this goal include adding the following descriptions: grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height).
		1b-2	Use GIS measures and surveys to identify critical grassland and scrub/shrub habitats, assess their condition for nesting birds (grassland birds and woodcock), and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for mowing, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to maintain and enhance large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat and create interspersed early-successional habitat.	***PRIORITY***	This action was divided into two separate actions, one focusing on core grasslands, the other on scrub-shrub habitats. An oversight in the February 16, 2007, version of the Wildlife Action Plan includes the continued exclusion of addressing other scrub-shrub species (e.g., butterflies, moths, odonates) other than birds. This will be corrected in the next version.
		1b-3	Increase the effective size and connectivity of grasslands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures and surveys to identify important corridors that connect large, contiguous tracts of grasslands and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies. Consolidate adjacent grassland fields, through the elimination of hedgerows, fences, or tree lines, in areas where open land occupies a considerable amount of the surrounding landscape and grassland management can be identified as a reasonable management alternative. Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Target 2,000 hectare (7.7 sq. mi.) regions.	***PRIORITY***	
		1b-4	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. Maintain existing grassland and scrub-shrub habitats and work to establish new grasslands or scrub/shrub habitats along utility-line rights-of-way.		
		1b-5	Use GIS measures and surveys to identify areas within or adjacent to large forest parcels that have the potential to provide habitat for early succession species such as the golden-winged warbler, woodcock and ruffed grouse while protecting the integrity of the forest for area-sensitive species. Manage areas within large forest parcels to provide and maintain early succession habitats.		The greatest concern within this action pertained to the need for clarification of early-successional habitats adjacent to forests . Revisions to address this include revising the action, changing "early-successional" to "scrub-shrub" and revising the goal to describe scrub-shrub habitat as "areas with >25% woody vegetation <20 feet in height)."
		1b-6	Work with Bureau of Land Management to identify appropriate sites on public lands to maintain and enhance grasslands. Establish mowing schedules, control exotic, invasive vegetation, and establish stands of native warm season grasses on 30 - 50 acres per year within the Landscape region.		
		1b-7	Develop best management practices to guide public and private land managers in maintaining and enhancing grassland and other early succession habitats.		The greatest concern within this action pertained to the need for clarification of particular terms (e.g., early-successional grasslands, scrub-shrub) . To address this, the action was revised changing "early-successional" to "early-successional (scrublands and shrublands)" and the goal was revised to include adding the following descriptions: grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height).

Goals (1-13)	Conservation Actions' Numbers		SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	1c	Aquatic, Wetland, riparian, and floodplain			
		1c-1	Use GIS measures, other remote-sensing tools, and surveys to identify and best management practices to maintain wetlands with snags of dead trees for red-headed woodpeckers and other cavity-nesters.		
		1c-2	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process.		
		1c-3	Protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database.		
		1c-4	Locate potential vernal pools through aerial imagery and surveys and integrate certified vernal pools into the DEP regulations database and Landscape Project.	***PRIORITY***	It was suggested that actions 1c-4 and 1c-5 are combined, however the two actions remain separate as one focuses on locating pools the other on identifying the threats to the pools.
		1c-5	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species.		It was suggested that actions 1c-4 and 1c-5 are combined, however the two actions remain separate as one focuses on locating pools the other on identifying the threats to the pools.
		1c-6	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors.	***PRIORITY***	Revision includes changing the statement, "…surrounding private lands through incentive programs and targeted land acquisition. " to "...surrounding private lands through incentive programs and targeted land acquisition through local land use policy and planning."
		1c-7	Reduce the impacts of mute swan herbivory to native vegetation in wetlands and managed impoundments. Mute swan populations should be reduced to the population objectives identified for New Jersey in the Atlantic Flyway Mute Swan Management Plan.		
		1c-8	Identify and implement actions to restore, maintain and/or protect riverine habitat, as appropriate, for target species. Actions can include acquisition, landowner incentives for protection and management, livestock fencing, no-mow riparian buffers, planting native vegetation in riparian zones to shade streams and control water temperatures.		Request to include incentive programs such as CREP and others, however this action is inclusive of all incentive programs and therefore, was not revised.
		1c-9	Increase populations of pied-billed grebes and American bitterns through freshwater wetland management such as creating impoundments, maintaining appropriate water levels, restricting recreational activities and monitoring contaminant levels.		
	1d		Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available.		The term "Species Occurrence Area" has been defined within the Wildlife Action Plan Appendix IV.
	1e		Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Park Service to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures).		
	1f		Protect wildlife species of special concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all critical wildlife habitats, public and private conservation lan		Action addressed under "5o" below.
	1g		Enhance targeted habitats for cavity-nesters, forest passerines, freshwater wetland birds, grassland birds, scrub/shrub birds and woodland raptors through the use of best management practices.		
	1h		Use GIS measures, other remote-sensing tools, and surveys to identify important winter foraging sites for short-eared owls and northern harriers. Work with public and private landowners and managers to protect and maintain suitable wintering habitat through incentive programs, best management practices, and acquisition.		
	1i		Reclaim degraded habitats by working with land management agencies to determine the appropriate control methods for eliminating harmful, invasive, non-native vegetation. Restore native vegetation, especially in large wetland complexes throughout this region.		Revised to: "Reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat values for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, re-vegetation with native plants or restoring habitat structure."
	1J		Support programs, provide guidance and work with public and private landowners and managers to eliminate or control harmful, invasive, exotic vegetation in areas where it is presenting a threat to species of conservation concern.		

Goals (1-13)	Conservation Actions' Numbers	SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
2	**Protect water quality and the availability of wetland habitats.**			
	2a	Maintain optimal biological buffers (300 meters) around wetlands, riparian and floodplain areas and minimize destruction per the Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey. Encourage native plantings through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion.	***PRIORITY***	The greatest concern within this action pertained to the lack of distinction between an optimal biological buffer of 300 meters versus regulatory buffers as it may conflict with Highlands recommendations and/or overlap areas where farmland lies within the 300 meters. However, the main point of this action is to stress the inefficiency of the current regulatory buffers to protect wetlands for wetland-dependent species. Therefore, the action has been revised from, "Maintain optimal biological buffers (300 meters) around wetlands,..." to "Maintain optimal biological buffers beyond regulatory requirements around wetlands,..."
	2b	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts.		
	2c	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters.	***PRIORITY***	
3	**Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.**			
	3a	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the level of impact on the ecosystem.	***PRIORITY***	
	3b	Work with land management agencies to survey for and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the hemlock woolly adelgid, gypsy moth, and emerald ash borer. Research control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations.		
	3c	Work with public and private landowners and managers to employ appropriate physical, chemical or biological control measures, or a combination of these, to reduce invasive non-indigenous plants in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants.	***PRIORITY***	
	3d	Monitor forest regeneration via a system of exclosures and vegetative sample plots throughout critical habitats on state lands to evaluate habitat health in response to changing deer densities. The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will apply these data in making deer management decisions regarding appropriate seasonal harvest limits. Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where regeneration of native vegetative communities is possible.	***PRIORITY***	
	3e	Work with the Bureau of Wildlife Management to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration.		
	3f	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer (e.g. “earn-a-buck”).		
4	**Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species.**			
	4a	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas.	***PRIORITY***	An oversight in the February 16, 2007, version of the Wildlife Action Plan, this action was not revised. The next version will be revised to, "Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas. "
	4b	Conduct concentrated field sampling for listed or special concern fish species in areas indicated by Fish Track database queries and incorporate data into the Biotics database.	***PRIORITY***	
	4c	Identify and research water quality parameters for spotted turtles, Fowler’s toads, Jefferson salamanders, marbled salamanders, northern spring salamanders, dwarf wedgemussels, brook floaters, creepers, eastern lampmussels, triangle floaters, and nongame fish. Assess impacts and incorporate into BMPs.		Action 4c and 4e listed different species. These actions have been revised to include a consolidated, inclusive list of species.
	4d	Systematically survey the Skylands Regional Landscape for all endangered and threatened species and selected species of special concern to determine and track population and habitat trend data (e.g. woodland raptors to be surveyed every four years) in comparison to land use changes and alteration of habitat through long-term sampling and surveys.	***PRIORITY***	
	4e	Research and evaluate effectiveness of water quality management practices on freshwater wetland birds, bog turtles, wild coldwater fisheries and aquatic invertebrates, particularly those practices associated with permitting or mitigation actions, and revise management actions where appropriate.	***PRIORITY***	Action 4c and 4e listed different species. These actions have been revised to include a consolidated list of species.
	4f	Conduct mid-winter and breeding waterfowl surveys annually to monitor population trends.		

Goals (1-13)	Conservation Actions' Numbers	SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	4g	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species.	***PRIORITY***	
	4h	Conduct surveys to find more information about species and management requirements for secretive marsh nesting birds.		
	4i	Use GIS measures, other remote-sensing tools, and surveys to determine home range territories and habitat use for bobcats and wood turtles, and to identify important travel corridors and to identify critical habitats for dwarf wedgemussels and other special concern mollusks, wood turtles, special concern reptiles and amphibians, nongame fishes, silver-bordered fritillaries and special concern damselflies and dragonflies and assess their condition for maintaining populations. Work with the Bureau of Freshwater fisheries to identify critical nongame fish and native trout habitat. Use the new data to refine species occurrence areas and integrate into the Biotics database.	***PRIORITY***	
	4j	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks), northern saw-whet owls and eastern screech-owls.		
5	**Prevent, stabilize and/or reverse declines of endangered, threatened, and special concern species.**			
	5a	Research effects of parasites and diseases on on special concern fish species' populations.		
	5b	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals).	***PRIORITY***	Request to combine 5b and 5h was denied as 5b focuses on research to identify sites where crossings occur and 5h focuses on management and protective strategies for identified sites.
	5c	Locate Identify critical hibernating, gestating, and basking habitats for timber rattlesnakes along the Kittatinny Ridge through GIS measures, other remote-sensing tools, and surveys. Develop protection strategies to minimize human disturbance and illegal collecting at these sites. Work with public land managers to minimize recreational activities in critical areas. Enlist assistance from state and federal law enforcement personnel to monitor vulnerable areas**ALSO, a similar action:** Maintain and enhance reptile and amphibian populations, particularly those that are endangered because of illegal collection for the pet trade (wood and bog turtles) and those populations most susceptible to road mortality (known box turtle breeding locations near roads and amphibian breeding migration corridors).	***PRIORITY***	
	5d	Compile better life history information on urban species, such as kinds of nest predators and levels of nest depredation, breeding longevity and reproductive effort over time, characteristics of preferred nesting requirements, fidelity to breeding and wintering sites, and better assessment of migration routes and destinations.		
	5e	Develop and implement management actions to enhance populations of special concern and rare fish.	***PRIORITY***	
	5f	Prevent fish declines by utilizing the Delphi process initiated by the Division of Fish and Wildlife in 2003 to determine fish species that may warrant "special concern status."		
	5g	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. Continue to monitor reproductive success of eagles.		
	5h	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts.	***PRIORITY***	Request to combine 5b and 5h was denied as 5b focuses on research to identify sites where crossings occur and 5h focuses on management and protective strategies for identified sites.
	5i	Investigate causes of decline and develop models based on habitat requirements of American kestrel and barn owl; identify most effective methods to restore and enhance habitat and provide nest cavities (standing dead biomass and nest boxes).		
	5j	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands.	***PRIORITY***	
	5k	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss and degradation, edge, disturbance, predation, disease, food availability, contaminants, water quality, invasive plants, and hybridization. Identify groundwater recharge areas for blue-spotted salamander breeding sites and incorporate the sites into the Biotics database.	***PRIORITY***	

Goals (1-13)	Conservation Actions' Numbers	SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	5L	Protect species of greatest conservation need from exotic pathogen introduction or incident through rapid response; DFW to give priority attention to these species in planning or implementing a response.	***PRIORITY***	
	5m	Research the habitat requirements for forest passerines and woodland raptors, timber rattlesnakes, bobcats, and Indiana bats, when appropriate. Research and experimentally implement planned silviculture practices to develop guidance for enhancing forests for these species and species suites.	***PRIORITY***	
	5n	Develop research proposal to investigate the impact of land use patterns on woodland raptors and rare reptiles and amphibians.		
	5o	Protect wildlife species of special concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all critical wildlife habitats, public and private conservation lands.		Revision includes changing statement, "...public and private conservation lands." to "...public and private conservation lands by working with law enforcement agencies and implementing other means as they are developed."
	5p	Work with public and private landowners and managers with significant bog turtle, timber rattlesnake, northern copperheads, wood turtle, cavity-nester, freshwater wetland bird, grassland bird, woodland raptor, interior-forest bird and scrub-shrub/open field bird populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs.	***PRIORITY***	
	5q	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitat for Mitchell's satyr and silver-bordered fritillaries and manage for the proliferation of host vegetation and to retard succession where appropriate.		
	5r	Use GIS measures, other remote-sensing tools, and surveys to identify, and best management practices to maintain, enhance, and/or protect critical habitats for dwarf wedgemussels, brook floaters, and creepers, wood turtles, northern harriers, and barred owlsand assess their condition for maintaining populations. Develop protection strategies to maintain and enhance populations and habitat (e.g., innovative public and private partnerships, provide private landowner incentives and develop cooperative agreements to protect and manage habitat).	***PRIORITY***	
	5s	Assess specific threats to dwarf wedgemussel, brook floater and creeper, wood turtle, special concern reptiles and amphibians, nongame fishes, silver-bordered fritillaries and special concern damselflies and dragonflies. Work with public and private landowners and managers to protect, maintain, enhance, and restore habitat, as appropriate, through acquisition of, restoration of, and incentive programs focused on riparian habitats to maintain water quality and reduce siltation.	***PRIORITY***	
	5t	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss and degradation, edge, disturbance, predation, disease, food availability, contaminants, water quality, invasive plants, and hybridization.		This action was repeated In this worksheet…deleted from here, see 5k.
	5u	Develop habitat conservation goals that will meet the recovery needs of endangered and threatened wildlife populations that depend on forest habitats. These include guidelines for forest silviculture on public and private lands to enhance forest maturity and canopy, and replanting to reduce fragmentation.	***PRIORITY***	
	5v	Trap and relocate beaver when their dams threaten bog turtle and/or rare plant populations.		
	5w	Use GIS measures, other remote-sensing tools, and surveys to identify critical wetland habitats and assess their suitability for bog turtles and/or other wetland dependent species. Maintain, enhance, and restore populations through habitat protection, management and maintaining appropriate water levels and buffers, as appropriate, such as innovative public and private partnerships, incentive programs, and cooperative agreements to protect and manage habitat. Additional actions can include fencing and grazing, maintaining protective buffers, eliminating invasive, non-native vegetation and controlling water levels in impoundments.	***PRIORITY***	
	5x	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for breeding, migratory, and wintering waterfowl populations. Maintain, protect, enhance, and restore these sites, as appropriate, through acquisition, incentive programs, and best management practices.		
6	**Assess large-scale habitat change (every five to 10 years).**			
	6a	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.	***PRIORITY***	

Goals (1-13)	Conservation Actions' Numbers	SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
7	**Protect and enhance important and unique natural communities.**			
	7a	Federal, state, and local agencies to cooperatively map significant natural communities.	***PRIORITY***	Revised from "...to cooperatively map…" to "...will work with the NJ DEP, Natural Heritage Program to cooperatively map…"
	7b	Federal and state agencies, non-government organizations, and private landowners to maintain and protect habitat through best management practices, incentive programs, and land acquisition (where appropriate) for the following: suitable habitat for area-sensitive species within the Delaware Water Gap National Recreation Area, Stokes State Forest, High Point State Park, Worthington State Forest, and adjacent wildlife management areas, critical bog turtle sites on public and private lands within the Wallkill National Wildlife Refuge and Wallkill River Watershed, to protect and enhance the unique natural communities that support endangered species and species of conservation concern at White Lake and the Johnsonburg Preserve, and private lands adjacent to the Alpha grasslands to be managed for grassland species effectively increasing the size of suitable habitat.	***PRIORITY***	
	7c	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats such as Bull's Island State Park and the Delaware River Floodplain Forests, Delaware Water Gap National Recreation Ar Stokes State Forest, High Point State Park, Worthington State Forest, and adjacent wildlife management areas, Wallkill National Wildlife Refuge and Wallkill River Watershed, Black River WMA and Round Valley Reservoir, Great Piece Meadows, Bog & Vly Meadows, and Troy Meadows, and other "oases" in urban and suburban areas.		
	7d	Work with local governments and NJ DEP's Natural Heritage Program (NHP) to protect and enhance endangered plant communities and the following through incentive programs, land acquisition, best management practices, and increased law enforcement to minimize disturbance in sensitive areas (where appropriate): the high quality floodplain forest natural community at the Bull's Island State Park and the Delaware River Floodplain Forests, Great Piece Meadows, Bog & Vly Meadows, and Troy Meadows, the large wetland complex of the Wallkill National Wildlife Refuge, Wallkill River Watershed, White Lake, Johnsonburg Preserve, and Black River Wildlife Management Area (and Great Piece Meadows, Bog & Vly Meadows), the forests and unique talus habitats in Ringwood State Park and surrounding areas and the Picatinny Arsenal.		
8	**Identify and protect summer habitat for Indiana bats and other forest-dwelling bat species.**			
	8a	Conduct statewide sampling to determine distribution, range, and habitat use of summer bats.		
	8b	Continue volunteer-based summer bat concentration surveys to locate important maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys.		
	8c	Conduct telemetries study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies; and during spring emergence from hibernacula to determine dispersal distances, roost characteristics, and travel corridors of Indiana bats.		
	8d	Evaluate and assess impacts of wind turbines to populations of bats.		
	8e	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices).		
	8f	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999).		
	8g	Trap Indiana bats during spring emergence from hibernacula and apply colored, plastic bands to aid in recovery efforts during summer concentration surveys.		
9	**Identify and protect hibernation sites for Indiana bat and other winter resident bat species within New Jersey**			
	9a	Survey abandoned mines, caves, and railroad tunnels and determine their suitability as winter roost sites; sites where bats are observed will be incorporated into the Biotics database. Recruit private and public land managers to protect active hibernacula from human disturbance.	***PRIORITY***	
	9b	Decrease or eliminate human disturbance and vandalism at hibernacula through increased patrols by the Bureau of Law Enforcement.		

Goals (1-13)	Conservation Actions' Numbers	SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	9c	Identify and implement appropriate protection strategies to maintain and enhance habitat (e.g., working with recreational groups to limit cave and mine access to summer months, landowner incentives for protecting winter habitat) including the installation of bat-friendly gates on important bat winter roost sites to prevent human disturbance. Assess the nee stabilization and gating of important bat hibernacula to ensure structural soundness and prevent human disturbance. Install data loggers in important hibernacula to monitor internal conditions and to evaluate the impacts of the gating structures on those conditions.	***PRIORITY***	
	9d	Identify and protect critical staging habitat surrounding known hibernacula.		
10	**Protect, enhance, and restore coldwater fish habitat and ecosystems. ---HABITAT FOCUS**			
	10a	Use GIS measures and surveys to identify critical habitats for freshwater nongame fish and native, wild trout and assess their condition for maintaining populations.	***PRIORITY***	
	10b	Monitor changes in water quality and assess the impacts to the native trout populations on specific waterways where native, wild, summer trout habitat may be in jeopardy due to declining water quality.		An oversight in the February 16, 2007, version of the Wildlife Action Plan, this action was not revised. The next version will be revise to, "Monitor changes in water quality and assess the impacts to the native trout populations on specific waterways where nativ wild trout habitat may be in jeopardy due to declining water quality attributable to human impacts."
	10c	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems.	***PRIORITY***	
11	**Conserve and enhance native, wild trout populations at optimal levels. ---POPULATION FOCUS**			
	11a	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources.	***PRIORITY***	
	11b	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations.		
	11c	Develop population management strategies to assure the protection of NJ's wild coldwater fisheries.	***PRIORITY***	Request to combine 11c and 11d denied as 11c focuses on management strategies and 11d focuses on protection through law enforcement.
	11d	Protect native, wild trout populations by increasing the enforcement of established fishing regulations.		Request to combine 11c and 11d denied as 11c focuses on management strategies and 11d focuses on protection through law enforcement.
12	**Prevent illegal collection of rare reptiles and amphibian.**			
	12a	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement of critical sites (nesting, basking, gestation, dens) to implemen stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles), persecution (timber rattlesnake), and hu an disturbance (off-road-vehicles).		
	12b	Recruit and educate local law enforcement on endangered species laws by developing and hosting a training seminar. Develop a partnership between local law enforcement, USFWS Special Agents, and the NJ Division of Fish and Wildlife's Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles), persecution (timber rattlesnakes), and human disturbance.	***PRIORITY***	
13	**Promote public education, awareness, wildlife conservation, and participation in habitat restoration efforts on private land.**			
	13a	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies.	***PRIORITY***	
	13b	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control.		
	13c	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often landscaping companies as introduced ornamental plants are a major source of non-indigenous spe that invade natural plant communities.	***PRIORITY***	Request to include action to support new regulations that prohibit the sale of non-native, invasive plants. This request is considered a st level issue and therefore, will be considered for integration into the state-level portion of the Wildlife Action Plan. Currently, an action within the state-level section addresses legislation to regulate the sale of invasive plants for ornamental or restoration use, but does not target non-native species in particular.

Goals (1-13)	Conservation Actions' Numbers	SKYLANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	13d	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state and non-governmental organization partners.		Revised from "…with federal, state and non-governmental organization…" to "...with federal, state, local, and non-governmental organization…"
	13e	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, etc; work to develop a statewide policy for local communi to discourage managed cat colonies and trap, neuter and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies.	***PRIORITY***	
	13f	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species.		
	13g	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program.	***PRIORITY***	
	13h	Educate homeowners about habitat requirements of chimney swifts and discourage use of chimney caps where possible.		Revised to: "Educate homeowners about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety)".
	13i	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna.	***PRIORITY***	
	13j	Develop brochures and posters about management practices for the public and for private landowners with significant bog turtle, wood turtle, cavity-nester, grassland bird, forest passerine, woodland raptor, scrub-shrub/open field bird populations.		
	13k	Develop educational programs, brochures and posters for the public regarding tolerance and protection of timber rattlesnakes and their habitat.	***PRIORITY***	

Attachment H: Report on Atlantic Coastal Regional Landscape Stakeholder Implementation Meeting (March 29, 2007)

DRAFT
Summary Report on the Wildlife Action Plan Atlantic Coastal Implementation Meeting

Environmental Law Institute
to
New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program

March 2007

Executive Summary

In February 2006, the Conserve Wildlife Foundation of New Jersey, in partnership with the New Jersey Department of Environmental Protection's Division of Fish and Wildlife, convened over 40 stakeholders from organizations that focus on statewide issues. The first statewide stakeholders' meeting was held at Duke Farms in Hillsboro, New Jersey. Their role was to discuss and select priority state-level goals from those identified in the New Jersey Wildlife Action Plan. Stakeholders identified 13 priority state-level goals, which can be found in Attachment A.

The second statewide Wildlife Action Plan Stakeholder Meeting was held on Thursday, April 6, 2006, at Duke Farms. The primary goal of the meeting was to solicit stakeholder input into prioritizing state-level conservation strategies (actions) associated with the 13 priority state-level conservation goals identified at the first meeting. Participants from organizations that focus on statewide issues discussed and debated the state-level conservation strategies and provided their input on refining and prioritizing them. Seventy-two conservation strategies were selected as priorities. These can also be found in Attachment A.

On March 29, 2007, local stakeholders associated with the Atlantic Coastal (Coastal) Regional Landscape convened for the Coastal Wildlife Action Plan Implementation Meeting held at the Richard Stockton College of New Jersey in Pomona, New Jersey. This was the third of five regional landscape meetings to be held throughout the state. The goal of this meeting was to identify a set of priority conservation actions to drive implementation of the state's Wildlife Action Plan in the Coastal Regional Landscape.

Background

On March 29, 2007, the Conserve Wildlife Foundation of New Jersey (CWF) convened the Coastal Wildlife Action Plan Implementation Meeting in partnership with the New Jersey Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW). The meeting was held at the Richard Stockton College of New Jersey in Pomona, New Jersey.

The meeting was the third of five Wildlife Action Plan landscape-level prioritization meetings. Forty-one (41) attendees including twenty-nine (29) stakeholders (non-DFW personnel), who attended the meeting, worked to identify a set of fifty-one (51) priority conservation actions among the 100 conservation actions* identified in Atlantic Coastal portion of the New Jersey Wildlife Action Plan. These fifty-one (51) priority conservation actions will be used by DFW and its conservation partners to guide conservation efforts and resources toward implementation of the state's Wildlife Action Plan in the Coastal Regional Landscape.

The New Jersey Wildlife Action Plan (Plan) is a proactive plan to conserve wildlife species before they become more rare and more costly to protect. The multi-scale plan identifies threats, conservation goals, and conservation actions at the state, landscape (5 regions; ocean is currently part of the Atlantic Coastal Regional Landscape), and sub-regional levels (identified as conservation zones within New Jersey's Plan). New Jersey submitted its Plan to the U.S. Fish and Wildlife Service on October 1, 2005, submitted its revised plan on July 26, 2006, and received final approval from the Service in September 2006.

The New Jersey Wildlife Action Plan is a living document and will undergo periodic revisions per comments and recommendations received by the public, through the regional stakeholder meetings, and as part of the adaptive management strategy outlined within the Plan. Digital copies of the Plan are available at the Division of Fish and Wildlife's Web site: www.state.nj.us/dep/fgw/ensp/waphome.htm

Summary of Coastal Implementation Meeting

The objectives of the Coastal Implementation Meeting were to:

- Provide stakeholders with a review the Coastal Regional Landscape conservation goals and actions;
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions; and
- Seek stakeholder input on and identify fifty-one (51) specific and broad-based* priority conservation actions for the Coastal Regional Landscape.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

The Coastal Regional Landscape section of the New Jersey Wildlife Action Plan includes a number of goals, which focus on issues such as habitat conservation and protection, the conservation of populations of species of greatest conservation need, water quality, and public education and viewing opportunities. Each of the goals has a varying number of conservation actions associated with them that were developed to address the specific needs of each conservation zone (sub-regional level) within the Atlantic Coastal Regional Landscape. The implementation meeting was designed to:

- Provide local leaders and stakeholders with background on the objectives of the Wildlife Action Plan and its implementation;
- Provide a foundation for potential partnerships to implement the Wildlife Action Plan; and
- Seek stakeholder input to determine priority conservation actions for the Coastal Regional Landscape.

In preparation for the working meeting, DFW's Endangered and Nongame Species Program (ENSP) staff reviewed the 100 specific and broad-based* conservation actions associated with the Coastal Regional Landscape and indicate which actions the ENSP considered priorities. The invited stakeholders were asked to review *in advance* the goals and actions associated with the Coastal Region, as well as those actions pre-selected by the ENSP. The majority of the day was devoted to further discussion and clarification of conservation actions and final prioritization of the actions.

Introductory Sessions

Carol Slocum, an Associate Professor in Marine Sciences at the Richard Stockton College of New Jersey, gave welcoming remarks. She expressed enthusiasm for hosting the meeting given the college's commitment to the conservation of marine mammals and sea turtles.

Dave Jenkins, Chief of ENSP, welcomed stakeholders and provided attendees with background on the purpose of the New Jersey Wildlife Action Plan and its basis in the Landscape Project. Jenkins stated that the plan is designed to be a blueprint for wildlife conservation for the full array of traditional and non-traditional conservation partners in the state, and is not solely the Division of Fish and Wildlife. His presentation focused on the conservation potential in New Jersey and he discussed the role and importance of partnerships in achieving conservation objectives in New Jersey.

Jessica Wilkinson, a senior policy analyst with the Environmental Law Institute, served as the facilitator, and gave an overview of the meeting objectives and agenda.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

Todd Plover, a biologist with the Conserve Wildlife Foundation of New Jersey and manager of the Beach Nesting Bird Project, gave a presentation on the threats to the habitat and wildlife of the Coastal Regional Landscape.

Jeanette Bowers-Altman, a senior zoologist the with Endangered and Nongame Species Program, presented participants with an overview of the results of the New Jersey Marine Mammal and Sea Turtle Conservation Workshop, which was held at Richard Stockton College of New Jersey on April 17-19, 2006. The purpose of the workshop was to develop the knowledge base necessary to guide the state's marine endangered and nongame resource conservation and management programs by identifying which species the state should focus on and what actions it should take to conserve them. New Jersey is home to 11 endangered and threatened marine species; half of the federal listed species in New Jersey are marine species. The workshop brought together experts from 13 agencies and organizations. The workshop identified 16 focal species, identified information gaps, identified and ranked 39 threats to marine species, and developed recommendations, conservation actions, and projects that could be brought to bear in addressing the recommendations. The recommended actions fell into four categories: threat abatement; life history and ecological research; outreach and education; and protection and enforcement. As of this meeting, the report from the New Jersey Marine Mammal and Sea Turtle Conservation Workshop has not been posted for public access. The ENSP intends to post it on their website in the near future (www.njfishandwildlife.com/ensphome.htm).

Beth Brandreth, with the U.S. Army Corps of Engineers' Philadelphia District, discussed the Lower Cape May Meadows Restoration Project. The project is a demonstration of a restoration effort that supports the goals of the New Jersey Wildlife Action Plan. The project goals were to: protect and restore the Cape May beach and freshwater habitat; improve habitat for endangered species (i.e., piping plover and endangered plants); improve internal water quality; eliminate and control nuisance plant species; increase the availability of freshwater; and reduce storm damage vulnerability to Cape May and West Cape May. The selected plan for the project include restoring lost wetlands, beachfill with periodic nourishment, invasive plant control, and internal hydrology improvements.

Stephanie Egger, with the New Jersey Field Office of the U.S. Fish and Wildlife Service, presented another example of a collaborative project that supports the goals of the New Jersey Wildlife Action Plan. She spoke about beach management planning for federal- and state-listed species. The agency works closely with local municipalities to support beach management planning.

Kris Schantz, a senior biologist with ENSP and coordinator of the New Jersey Wildlife Action Plan, gave a summary of the priority actions selected by the ENSP in advance of the meeting. She stated that for the Coastal Region, the plan includes 8 broad-based* conservation goals and 100 specific and broad-based* conservation actions associated with those goals. In addition, Ms. Schantz informed participants that the actions not selected as priority will remain in the Plan as an integral part of the Plan's success to achieve the desired objectives, but that the priority list helps provide guidance to our stakeholders when allocating limited resources for future conservation projects. Ms. Schantz also informed participants that granting organizations such as the Geraldine Dodge Foundation and the Doris Duke Charitable Foundation will be more likely to fund projects that are addressed in the states' Wildlife Action Plans.

Facilitated Discussion

The majority of the remainder of the day was devoted to a discussion of the conservation actions associated with each of the region's conservation goals. Wilkinson led the participants through a discussion of each of the goals in turn. She asked participants to offer their comments on which of the conservation actions they considered to be of particular importance and which they felt were of lesser importance. In addition, participants were able to seek clarification on any of the actions that were unclear and add back in for further consideration actions not identified by ENSP as priorities.

After a thorough discussion of the actions associated with each goal, the participants were asked to select a predetermined number of conservation actions they considered the highest priority for implementation within that goal. The number of actions participants were asked to select for each goal are found in Chart 1 below. In addition, ENSP staff assured the stakeholders that the potential edits to the actions discussed at the meeting would be reviewed and incorporated where feasible, and the actions would be revised to include measurable outcomes. The results of the participants' selection

	Number of conservation actions per goal
Goal 1	10
Goal 2	2
Goal 3	9
Goal 4	18
Goal 5	4
Goal 6	2
Goal 7	6
Goal 8	N/A – 1 by default

Chart 1: Number of conservation actions participants were asked to select for each of the conservation goals.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

and the original actions with notes of revisions incorporated into the Plan can be found in Attachment D.

Concluding Remarks
Dave Jenkins gave closing remarks and thanked the participants for their time and contributions.

APPENDICIES:
A: Priority State-level Conservation Goals and Strategies (Actions)
B: List of Atlantic Coastal Regional Landscape Invitees and Attendees
C: Atlantic Coastal Wildlife Action Plan Stakeholder Meeting Final Agenda
D: Atlantic Coastal Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Attachment A: Priority State-level Conservation Goals and Strategies (Actions)

New Jersey Wildlife Action Plan
Priority State-level Goals and Strategies

Below you will find thirteen priority state-level goals identified at the First Wildlife Action Plan Stakeholder Meeting held on February 23, 2006, and the associated priority conservation strategies identified at the Second Wildlife Action Plan Stakeholder Meeting held on April 6, 2006. The goals have been categorized by the main topic and, where appropriate, the sub-topic as identified within the New Jersey Wildlife Action Plan. The goals and associated priorities have been arranged in categories and key words and concepts appear in bold to provide focus for the array of New Jersey partners in conservation, land managers and stewards, outreach initiatives, and residents interested in managing their lands to support native wildlife.

All of the goals and strategies have integrated public education and outreach and are to be implemented with an active adapted management strategy. The New Jersey Division of Fish and Wildlife hopes to receive continual feedback on implementation successes and failures that our state can integrate into the Wildlife Action Plan and implementation process.

Addressing National, Interstate, and Statewide Threats

Suburban sprawl and large-acre zoning

Goal: Identify and **protect** breeding, migration, and wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.

1. NJ Division of Fish and Wildlife (DFW) will collaborate with municipal and county planners to identify critical wildlife habitats for sensitive species and natural systems within their borders.
2. Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.
3. Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition, and land planning at all levels of government and non-government organizations.
4. Mitigate impacts of existing development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
5. Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
6. Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available.
7. DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include

clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.

8. Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
9. Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.

Goal: Maintain **connectivity of habitats** at the landscape scale.

1. Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
2. DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
3. Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
4. Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

Goal: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.

1. Reduce regulatory impediments to restoration and enhancement activities.
2. Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
3. Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
4. Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
5. Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
6. Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.

7. Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by GIS analysis.
8. Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
9. Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.

Goal: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.

1. Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
2. Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
3. Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
4. Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies, and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:.
    a. A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations.
    b. A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    c. A model ordinance for regulating feeding of wildlife.
    d. A model pet licensing ordinance.
    e. Mapping of colonies to evaluate impact on species of conservation concern.
5. Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
6. Create and implement a system for reporting and qualifying new locations of priority invasive species.
7. Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
8. Create implementation plan for Invasive Species Task Force recommendations when completed.

Unsustainable Land Management Practices on both Private and Conserved Lands and Water

Goal: Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

1. Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
2. Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
3. Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
4. Through surveys, increase the number of Category 1 streams justified by endangered and threatened species data.
5. Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using GIS and principles of landscape ecology as the foundation.

Direct Human Impacts on Native Wildlife and Ecosystem Health

Goal: Identify, protect, and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

1. Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
2. Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
3. Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
4. Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.

Development and Long-term Monitoring

Goal: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases to determine the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.

1. Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following:
   - o Breeding Bird Atlas
   - o Breeding Bird Survey
   - o Delaware Bay Migratory Shorebird Survey
   - o Bald Eagle Midwinter Survey
   - o Herptile Atlas
   - o Calling Amphibian Monitoring Program
   - o Fish Monitoring-Streams and Ponds
   - o Freshwater Mussel Atlas
   - o Mid-Winter Waterfowl Survey
   - o Atlantic Flyway Breeding Waterfowl Survey
   - o DFW Bobwhite Call-Count Survey
   - o Woodcock Call-Count Survey
   - o DFW Beaver-Otter Survey
   - o Migratory Game Bird Banding Programs
   - o Colonial Waterbird Survey
   - o Beach Nesting Bird Survey
   - o Site-specific Fish Monitoring Programs
2. Complete the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.
3. Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
4. Measure the enrollment acreage and effectiveness of backyard habitat management.
5. Through GIS, track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitor each site and evaluate the effectiveness of the management technique.
6. Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.

High Deer Densities

Goal: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific deer densities**.

1. Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
2. Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting,

Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.

3. Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
4. Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.
5. Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
6. Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.

Contaminants

Goal: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination**.

1. Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
2. Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
3. Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

Motorized Recreation Vehicles

Goal: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use**.

1. Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.

2. Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
3. Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
4. Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
5. Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.

Endangered, Threatened and Rare Wildlife

Goal: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protection of critical habitat, and habitat restoration and enhancement.

1. Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
2. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
3. Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.

Migratory Stopover and Important Bird Areas Planning

Goal: Identify, monitor, and **conserve key migratory corridors and stopover locations** for migratory birds.

1. Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
2. Annually monitor shorebird populations along the Delaware Bayshore stopover.
3. Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.
4. Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
5. Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers, and other "human-made" tall structures.

6. Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.

Review of Wildlife Action Plan

Goal: Ensure that **conservation activities** of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan (Plan).

1. The most current version of the Plan will be continually available for review on the Division of Fish and Wildlife's Web site with an open invitation to submit comments.
2. Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the Endangered and Nongame Species Advisory Committee (ENSAC), and a wildlife summit in which adaptive management will be built into the revision.
3. DFW will work with federal, state, county, municipal, and private (NGOs) land managers to incorporate the goals and strategies of the Plan into current management plans by the first formal review in 2011.
4. Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the ENSAC, the Fish and Game Council, and the Marine Fisheries Council.

Attachment B: List of Atlantic Coastal Regional Landscape Invitees and Attendees

Atlantic Coastal Regional Landscape Stakeholder Meeting: Wildlife Action Plan

List of Attendees

First	Last	Organization	Invited	Attended
James	Applegate	ENSP Advisory Committee	X	
Steve	Atzert	USFWS-Edwin B. Forsythe NWR	X	X
Pete	Bacinski	NJ Audubon Society – Sandy Hook Bird Observatory	X	
Scott	Barnes	NJ Audubon Society – Sandy Hook Bird Observatory	X	X
Tom	Baum	NJDEP – Division of Fish and Wildlife, Bureau of Marine Fisheries	X	X
Gary	Bell	New Jersey Waterfowlers Association	X	
Matt	Blake	American Littoral Society	X	
Jeanette	Bowers-Altman	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Beth	Brandreth	US Army Corps. of Engineers-PA District	X	X
Brian	Braudis	USFWS-Edwin B. Forsythe NWR	X	X
Barbara	Brummer	The Nature Conservancy-NJ Chapter	X	
Janet	Bucknall	USDA – APHIS Wildlife Services	X	
Joanna	Burger	ENSP Advisory Committee	X	X
Brent	Burke	The Nature Conservancy-NJ Chapter	X	X
Mark	Burlas	US Army Corps of Engineers – NY District	X	
Robert	Cartica	NJDEP-Division of Parks and Forestry, Natural Lands Management	X	
Paul	Castelli	NJDEP-Division of Fish and Wildlife, BWM	X	X
Dave	Chanda	NJDEP-Division of Fish and Wildlife, Director	X	
Kathy	Clark	NJDEP – Division of Fish and Wildlife, ENSP	X	X
Christopher	Claus	Cattus Island County Park	X	
Cindy	Claus	Jenkinson’s Aquarium	X	
Robert	Connell, Jr.	NJDEP – Bureau of Marine Water Monitoring	X	
Amy	Cradic	NJDEP, Asst. Commissioner	X	
Michael	Davenport	Conserve Wildlife Foundation of NJ	X	X

First	Last	Organization	Invited	Attended
William	DeCamp	Save Barnegat Bay	X	
Jim	DiLollo	NJDEP – Office of Construction and Engineering	X	X
Michael	DeLuca	Jacques Cousteau National Estuarine Research Reserve	X	
Joe	DeMartino	Ducks Unlimited – New Jersey Chapter	X	
Emile	DeVito	The NJ Conservation Foundation-Bamboo Brook and ENSP Advisory Committee	X	
Amanda	Dey	NJDEP-Division of Fish and Wildlife, ENSP		
Tim	Dillingham	American Littoral Society	X	X
Bill	Dixon	NJDEP – Bureau of Coastal Engineering	X	
Mark	Dobelbower	NJDEP – Division of Fish and Wildlife, Bureau of Law Enforcement, Chief	X	
Chris	Dolphin	NJDEP – Division of Land Use Regulation, Bureau of Coastal Regulation	X	
Ilene	Eberly	The Wetlands Institute	X	X
Stephanie	Egger	USFWS – NJ Field Office	X	X
Ruth	Ehinger	NJDEP-Coastal Management Program	X	
Stewart	Farrell	Richard Stockton College of NJ	X	
Jose	Fernandez	NJDEP-Division of Parks and Forestry	X	X
Dan	Ferrigno	NJDEP – Division of Fish and Wildlife, Bureau of Land Management	X	X
Tom	Fote	Jersey Coast Anglers Association	X	
Cristina	Frank	NJ Audubon Society	X	X
Jane	Galetto	ENSP Advisory Committee	X	X
Michael	Gochfeld	North American Butterfly Association	X	X
J. Frederick	Grassle	Rutgers University – Institute of Marine and Coastal Sciences	X	
Kevin	Hassell	NJDEP – Coastal Management Program	X	X
Jeanne	Herb	NJDEP – Office of Policy, Planning, and Science	X	
Jean	Heuser	Gateway National Recreation Area, Sandy Hook Unit	X	
Peter	Himchak	NJDEP – Division of Fish and Wildlife, Bureau of Marine Fisheries	X	
Lisa	Jackson	NJDEP, Commissioner	X	

First	Last	Organization	Invited	Attended
Dave	Jenkins	NJDEP-Division of Fish and Wildlife, ENSP, Acting Chief	X	X
Amanda	Johnson	National Marine Fisheries Service – Northeast Regional Office	X	
Jim	Joseph	NJDEP – Bureau of Shellfisheries	X	
Tom	Keck	NJDEP-Division of Parks and Forestry	X	X
Christina	Kisiel	NJDEP – Division of Fish and Wildlife, ENSP	X	X
Kim	Korth	NJDEP – Division of Fish and Wildlife, ENSP	X	X
Janet	Larson	ENSP Advisory Committee	X	
Rick	Lathrop	Rutgers University-CRSSA Lab and ENSP Advisory Committee	X	
Jay	Laubengeyer	The Nature Conservancy-NJ Chapter	X	
Julie	Lockwood	Rutgers University	X	
Tony	MacDonald	Monmouth University – Urban Coastal Institute	X	
Linda	Mack	Monmouth County Audubon Society	X	X
Stuart	Malmid	Monmouth County Audubon Society	X	
Michael	Mangum	Ocean County Dept. of Parks and Recreation	X	
Lisa	Manning	National Marine Fisheries Service – Office of Protected Resources	X	
Kari	Martin	Clean Ocean Action	X	X
Jenny	Mastantuono	USDA – APHIS Wildlife Services	X	X
Tom	McCloy	NJDEP – Division of Fish and Wildlife, Bureau of Marine Fisheries	X	
Joe	Meyer	NJDEP - Division of Fish and Wildlife, Bureau of Marine Law Enforcement	X	
Erica	Miller	Tri-State Bird Rescue	X	
David	Mizrahi	NJ Audubon Society	X	X
Ted	Nichols	NJDEP – Division of Fish and Wildlife, Bureau of Wildlife Management	X	X
Karl	Nordstrom	Rutgers University – Institute of Marine and Coastal Sciences	X	
Margaret	O'Gorman	Conserve Wildlife Foundation of NJ, Executive Director	X	X
Tony	Petrongolo	NJDEP-Division of Fish and Wildlife, Bureau of Land Management, Chief	X	

First	Last	Organization	Invited	Attended
Laurie	Pettigrew	NJDEP-Division of Fish and Wildlife, Bureau of Land Management	X	X
Todd	Pover	Conserve Wildlife Foundation of NJ	X	X
Lee	Rosensen	ENSP Advisory Committee	X	
Kris	Schantz	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Annette	Scherer	USFWS – NJ Field Office	X	X
Howard	Schlegel	USFWS – Cape May & Supawna Refuges	X	X
Bob	Schoelkopf	Marine Mammal Stranding Center	X	
Dale	Schweitzer	ENSP Advisory Committee	X	
Bob	Scro	Barnegat Bay National Estuary Program	X	
Bill	Shadel	American Littoral Society	X	X
James	Shissias	ENSP Advisory Committee	X	
Carol	Slocum	Richard Stockton College of NJ	X	X
Eric	Stiles	NJ Audubon Society	X	
Terry	Terry	NJDEP-Division of Fish and Wildlife, ENSP	X	
Karen	Terwilliger	Terwilliger Consultants, Inc.	X	
Ken	Thoman	Monmouth County Park System	X	X
John	Tiedemann	Rutgers University Marine Field Station	X	
Tom	Virzi	Rutgers University	X	
Jay	Watson	NJDEP-Commissioner's Office, Deputy Commissioner	X	
John	Weber	Surfrider Foundation – Jersey Shore Chapter	X	
Michael	Weinstein	New Jersey Sea Grant	X	
Jessica	Wilkinson	Environmental Law Institute	X	X
Peter	Winkler	NJDEP-Division of Fish and Wildlife, ENSP	X	
Patrick	Woerner	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Roger	Wood	Richard Stockton College of NJ	X	
Cindy	Zipf	Clean Ocean Action	X	

Attachment C: Atlantic Coastal Wildlife Action Plan Stakeholder Meeting Final Agenda

ConserveWildlife
FOUNDATION OF NJ

Wildlife Action Plan
Atlantic Coastal Landscape Implementation Meeting
Thursday, March 29, 2007
9:00 a.m. to 4:30 p.m.
Richard Stockton College of New Jersey
Townsend Residential Life Center - TRLC

Meeting Objectives

- Review Coastal Landscape goals and conservation actions
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions
- Seek stakeholder input on selection of priority conservation actions

Meeting Agenda

8:30 a.m. Continental Breakfast

9:00 a.m. Welcome and Opening Remarks
- Carol Slocum, Richard Stockton College of New Jersey

9:10 a.m. Introduction to the New Jersey State Wildlife Action Plan (WAP)
- Dave Jenkins, Acting Chief, Endangered and Nongame Species Program Division of Fish and Wildlife, Department of Environmental Protection
- Questions and Answers (5 minutes)

9:40 a.m. Overview and Introductions
- Jessica Wilkinson, Environmental Law Institute

9:50 a.m. Threats to the Habitat and Wildlife of the Coastal Regional Landscape
- Todd Pover, Beach Nesting Bird Project Manager, Conserve Wildlife Foundation of New Jersey

10:05 a.m. Results of New Jersey Marine Mammal and Sea Turtle Conservation Workshop
- Jeanette Bowers-Altman, Senior Zoologist, Endangered and Nongame Species Program or Michael Davenport, GIS Specialist, Conserve Wildlife Foundation of New Jersey
- Questions and Answers (5 minutes)

10:30 a.m. Break

10:45 a.m. Lower Cape May Meadows Restoration Project
- Beth Brandreth, US Army Corps of Engineers - Philadelphia District

11:00 a.m. Beach Management Planning for Federal and State-listed Species
- Stephanie Egger, US Fish and Wildlife Service – New Jersey Field Office

11:15 a.m. Summary of WAP Prioritization Process
- Kris Schantz, Senior Zoologist, Endangered and Nongame Species Program

11:30 a.m. Facilitated Discussion of Priority Actions

12:30 – 1:30 p.m. Lunch

1:30 p.m. Facilitated Discussion of Priority Actions (continued)

3:15 p.m. Break

3:30 p.m. Selection of Priority Actions

4:00 p.m. Wrap-Up & Next Steps
- Dave Jenkins, Acting Chief, Endangered and Nongame Species Program

4:30 p.m. Meeting Adjourns

Attachment D: Atlantic Coastal Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Goals (1-8)	Conservation Actions' Numbers		Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
1	**Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and species of conservation concern.**				
	1a	**Beach and Dune**			
		1a-1	Work with the U.S. Army Corps of Engineers (USACE) and the NJDEP Office of Construction and Engineering (OCE) to integrate designs into beach nourishment projects that increase availability of and access to nesting and foraging habitat for beach nesting birds.	***Priority***	
		1a-2	Investigate the efficacy of experimental techniques (e.g., restoration, enhancement) to improve foraging habitat for beach nesting birds.		
		1a-3	Develop, implement, and evaluate best management practices (BMPs), including dune management policies, to incorporate into beach nesting bird management agreements, through collaborative efforts with the U.S. Department of Agriculture (USDA) – Natural Resources Conservation Services (NRCS), U.S. Fish and Wildlife Service (USFWS), USACE, and NJDEP LURP.	***Priority***	Action revised to: "Develop, implement, and evaluate best management practices (BMPs), for dune management policies, to incorporate into beach nesting bird management agreements…"
		1a-4	Create and maintain additional nesting and foraging areas for the piping plover and other beach nesting bird species at Cape May NWR – Two Mile Beach Unit. Investigate if habitat restoration is appropriate at other beach nesting bird sites, including USCG – TRACEN and USCG – LSU.		
		1a-5	Develop and implement beach management agreements with municipalities. Update existing agreements. Where significant breeding populations of beach nesting birds are already present, ensure that a beach nesting bird component is included in management plans for their beach sites.	***Priority***	
		1a-6	Restore or enhance nesting and foraging habitat for beach nesting birds, including piping plovers, least terns, black skimmers, common terns, and American oystercatchers on the south side of the Barnegat Inlet. Restoration efforts include reduction of mature dunes and dense beach vegetation to create more suitable nesting habitat and the creation of tidally-flushed ponds for improving foraging habitat.		Stakeholders felt action 1a-6 is captured within action 1a-7 and requested they be combined or eliminate 1a-6. However, within the Wildlife Action Plan (Plan), actions 1a-6 and 1a-7 are not found within the same conservation zones. The actions were created specifically for different zones and will therefore, remain as is.
		1a-7	Work with federal and state agencies to enhance and/or restore critical beach and dune habitats for beach nesting birds of conservation concern.	***Priority***	
		1a-8	Restore natural beach and dune profile at the southern end of Brigantine Island where beach management practices have drastically reduced suitability of breeding habitat for beach nesting birds.		

Goals (1-8)	Conservation Actions' Numbers		Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	1b	**Coastal wetland habitat and waterways**			
		1b-1	Work with NJDEP-OCE, USACE, and other appropriate agencies to coordinate beneficial placement of dredge materials for creation, enhancement, or maintenance of colonial waterbird nesting, in particular with regards to Intercoastal Waterway restoration projects.	***Priority***	
		1b-2	Develop, implement, and evaluate best management practices for making dredge spoil deposition sites attractive to breeding, migrating, and wintering wildlife.		
		1b-3	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Restablish/retore historically important submerged aquatic vegetation beds to benefit waterfowl species.		
		1b-4	Investigate and improve marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl.	***Priority***	Action revised to: "Investigate and improve current marsh management techniques to benefit critical …"
		1b-5	Protect overwintering colonies and/or "haul out" areas for harbor seals by using GIS measures, other remote sensing tools, and surveys to identify important "haul-out" areas and post them to minimize human disturbance.		
		1b-6	Identify locations where undoing the effects of wetland ditching can benefit marsh species, especially high marsh or area-sensitive species, such as northern harriers. Implement restoration of these sites.		It was suggested to add "grid ditching" into this action as a method of restoration. However, grid ditching was a method used in the past in relation to human-related issues, it would not be appropriate for wildlife focused objectives. This action is about restoring habitats and therefore, remains as is.
	1c	**Forest/forested wetland (remaining parcels) & Scrub-shrub habitat (areas with >25% woody vegetation <15 feet in height, including late successional back dune vegetative communities, often characterized by presence of bayberry)**			
		1c-1	Use GIS measures, other remote sensing tools, and surveys to identify remaining parcels of scrub-shrub habitat and forest; protect and reduce incremental loss of these areas through either application of Coastal Zone Management (CZM) "critical wildlife habitat" designation or acquisition in order to benefit migratory songbirds, raptors, butterflies, and other species.	***Priority***	
	1d	Use GIS measures, other remote sensing tools, and surveys to identify critical beach/dune, coastal scrub-shrub, forest, and wetland habitats and assess their condition for nesting, migrating, and wintering birds, and other coastal species. Take action to minimize habitat loss by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or habitat management plans. Maintain information and incorporate all new survey and mapping data into the Landscape Project and Biotics database.		***Priority***	
	1e	Use GIS measures, other remote sensing tools, and surveys to identify areas where additional habitat-based regulatory measures or land acquisition would be appropriate to benefit wildlife species of conservation concern.			

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	1f	Incorporate sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping.		
	1g	Use GIS measures, other remote sensing tools, and surveys to identify areas where habitat restoration or enhancement would benefit wildlife species of conservation concern.	***n/a***	Stakeholders commented that action 1g (focused on restoration) is captured within action 1d and therefore, action 1g should be eliminated. This action was removed from the Plan.
	1h	Protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database.	***Priority***	
2	**Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.**			
	2a	Enhance or restore habitats for colonial waterbirds through the elimination or reduction of phragmites from dredge material sites to allow for the natural succession of woody habitats to benefit nesting long-legged wading birds or the creation of sandy substrate for ground nesting colonial waterbirds at selected sites. "Jump-start" natural vegetation (using nursery stock and seedlings) where appropriate.	***Priority***	Stakeholders recommended revising this action to clarify that the focus is on those sites currently not being used. The action has been revised to: "Enhance or restore habitats for colonial waterbirds...selected sites. Restoration efforts should focus on historic dredge material sites, so as to not further reduce the available locations for sediment deposit. If an active site is selected for restoration, efforts should be focused on areas that will not interfere with the sites' capacity to accept sediment. "Jump-start" natural...where appropriate."

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	2b	Develop, implement, and evaluate best management practices to address adverse effects of invasive plant and wildlife species (e.g. phragmites, mute swan) and over-abundant native wildlife (e.g. resident Canada geese, greater snow geese) on the quality of coastal wetland habitat.	***Priority***	For actions 2b and 2c, there was some dispute regarding whether or not these gulls are "invasive" or "overabundant" species. While disagreement continues, the species within action 2b are provided as examples and not a definitive list. It was also suggested that their presence, whether causing no impact or a negative impact, may be dictated by the location and the presence of wildlfe species of conservation concern. These actions will remain as is, but those wishing to implement these actions should consider the impact and role of gulls in the natural system.
	2c	Assess impacts of gull populations (laughing gull, greater black-back gull, herring gull) on the breeding success of beach nesting birds, colonial waterbirds, and other species to determine if integrated wildlife damage management of gulls is necessary.		
	2d	Monitor encroachment of Japanese sedge in beach/dune habitat, assess impacts on habitat quality, implement control efforts (e.g., herbicide and physical removal of plants) where appropriate, and research additional control methods.		
3	**Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species.**			
	3a	Conduct surveys and review existing databases to better identify the migratory songbird species using coastal habitat and the distribution of the species.	***Priority***	
	3b	Conduct surveys to determine distribution, population, and habitat use of coastal marsh birds, in particular high marsh specialists, such as northern harriers, black rails, and salt marsh sharp-tailed sparrows.	***Priority***	
	3c	Conduct mid-winter and breeding waterfowl surveys annually to monitor population trends.		
	3d	Research population distribution of northern diamondback terrapin to determine critical areas for protection. Use GIS measures, other remote sensing tools, and surveys to identify northern diamondback terrapin key crossing areas and work with local or state transportation agencies to erect turtle barriers.	***Priority***	Stakeholders requested the action be revised to include studies on reproductive success of the terrapins. However, this action focuses on distribution and critical locations. Action 4c, a more appropriate location for this addition, has been revised to address this request.

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	3e	Conduct baseline inventory of coastal mammal species, including the marsh rice rat and southern bog lemming and develop long-term monitoring plans to determine each species' population trend .		There was some confusion over the word "including" within the statement given only one other species (seals) would be targeted by this action. As such, the action has been revised: "Conduct baseline inventory of the marsh rice rat, southern bog lemming, and seals and develop long-term monitoring plans to determine each species' population trend."
	3f	Investigate home ranges of wintering Atlantic brant in relation to carrying capacity of back bay habitat for Atlantic brant.		
	3g	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions.	***Priority***	
	3h	Continue volunteer-based summer bat concentration surveys to locate important maternity sites and determine roost characteristics. Trap and band bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys.		
	3i	Assess significance of coastal region as an important travel corridor and concentration site for migratory tree-roosting bats through comparative surveys of their distribution through radio-telemetry, acoustical monitoring, mist-netting, and field searches during the migratory season.		It was suggested that butterflies be incorporated into this action. While the DFW agrees that migrant butterflies are in need of research and conservation, this action was specifically developed to focus on bat research and therefore, will remain as it. However, it should be noted that within the State-level Objectives (Section F of the Plan) under the Endangered, Threatened, and Rare Wildlife section is a priority action to, "Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata."
	3J	Continue monitoring all known pairs of peregrine falcons and selective pairs of osprey at targeted locations, including assessment of productivity and threats and coast wide survey of osprey population and nesting success on biannual basis. Track other regularly observed peregrine falcons to determine new nesting pairs/sites.	***Priority***	
	3k	Continue intensive monitoring of populations and reproductive success of beach nesting birds, including piping plover, least tern, black skimmer, common tern, and American oystercatcher, to determine population trends. Continue surveys of wintering population of American oystercatchers to determine abundance, distribution, and population trends.	***Priority***	

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	3L	Research and monitor comparative reproductive success of American oystercatcher and common terns on beach- vs. marsh-nesting habitat at selected sites, including identification of specific threats.		
	3m	Use existing survey data (NJAS SeaWatch, SeaNet Beach Bird Surveys) to develop a database of seabird species (near-shore migrants and pelagic birds) presence and their distribution and initiate additional survey efforts to gain a better understanding of usage patterns/distribution. Develop and implement a reliable survey for measuring pelagic bird populations and/or trends of near-shore water birds of conservation need.	***Priority***	
	3n	Investigate habitat selection of breeding colonial waterbirds, including use of phragmites.		
	3o	Determine reproductive success of colonial waterbirds at targeted nesting colonies. Identify factors limiting success (e.g., predators and possible effects of contaminants).		
	3p	Identify distribution of whales (particularly right whale) during seasonal migrations. Methods include but are not limited to a) conducting surveys in shipping lane vicinities and along the coast during whale migration to determine the seasonal distribution, b) developing a predictive GIS model (based on available species occurrence information and habitat data) to predict right whale migration routes off the NJ coast and conduct surveys to validate the model, and c) identifying whale distribution and right whale migration routes through the participation in the East Coast's Sightings Advisory System for mariners.	***Priority***	
	3Q	Increase or initiate monitoring programs for marine species of conservation concern where present data is insufficient.	***Priority***	There was some confusion regarding the lack of specificity within this statement regarding marine species. This action has been revised to focus on those species identified within the Plan; "Increase or initiate monitoring programs for marine species of conservation concern as identified within NJ's Wildlife Action Plan where present data is insufficient."
	3r	Use existing data to develop a database of the Atlantic bottlenose dolphin and harbor porpoise populations' abundance and distribution and initiate regular surveying and/or monitoring, if deemed necessary.		
4	**Prevent, stabilize and/or reverse declines of endangered, threatened, and special concern species.**			
	4a	Reduce deleterious effects of pesticides on coastal species and ecosytems by conducting investigations that assess the impacts of pesticides and biological controls on coastal species, in particular those species dependent on coastal marshes and wetlands. Evaluate and modify best management practices as appropriate.	***Priority***	
	4b	Provide the NJ Division of Fish and Wildlife's Bureau of Law Enforcement with a map of critical sites to implement stringent enforcement of endangered species laws including harassment and human disturbance; update map as additional data become available.	***Priority***	

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	4c	Enhance northern diamondback terrapin populations by: a) closing the harvest season until sustainable population levels are reached. Work with experts to determine the sustainable population goal, b) enforcing compliance with current crab trap regulations (e.g. turtle excluder devices), and c) evaluating if current regulations are sufficient, in conjunction with naturally occurring survivorship rates, to protect and reduce mortality of northern diamondback terrapin populations.		For the purpose of this prioritization worksheet, action 4c is a combination of three actions from the Plan. Only one of these actions will address the request to incorporate studies of reproductive success. The action within the Plan has been revised to: "Enhance northern diamondback terrapin populations by closing the harvest season until sustainable population levels are reached. Determine if protective regulations are sufficient, in conjunction with naturally occurring survivorship rates, to reduce mortality in northern diamondback terrapin populations."
	4d	Improve marsh management techniques to benefit critical wildlife species by conducting critical assessments of the effects of Open Marsh Water Management on wildlife species, in particular high marsh nesting birds and waterfowl. Evaluate and modify best management practices as appropriate.	***Priority***	
	4e	Develop, implement, and evaluate management actions to enhance populations of special concern and rare fish, and implement adaptive management strategies.	***Priority***	
	4f	Investigate impacts of aquaculture on waterfowl and other wildlife. Determine relative effects of locations and aquaculture techniques. If possible, develop management actions or aquaculture techniques to minimize impacts.		
	4g	Investigate carrying capacity of coastal salt marshes for wintering American black ducks and Atlantic brant to help inform management actions and priorities.		For clarification, this action has been revised to: "Determine carrying capacity of coastal salt marshes for wintering American black ducks and Atlantic brant to inform decisions in setting Atlantic Flyway population objectives and to guide management actions. "

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	4h	Investigate crab dredging impacts on back-bay habitats and wildlife. Determine if any restrictions are necessary to protect wildlife or habitats. If needed, determine the nature of restrictions on dredging activities that will achieve protection.		The concern at the stakeholders' meeting focused on whether this action is appropriate within the Coastal Region portion of the Plan or if it should be located within the Piedmont under the Raritan Bay area. Given the focus of the Piedmont's Raritan Bay conservation zone is the terrestrial landscape and the issues outlined within this action are related to the back-bay areas of the Coastal Region in addition to the Delaware and Raritan Bays, it will remain in this section of the Plan.
	4i	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery. Plan (U.S. Fish and Wildlife Service, 1999). Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices).		
	4J	Maintain osprey nesting opportunities through repair and replacement of existing man-made structures. Identify where additional nesting structures would be appropriate.	***Priority***	
	4k	Continue to monitor fish stocks, in particular menhaden, to determine the effects of reduced or changing prey base on the reproductive success of osprey.		
	4L	Continue existing management practices that minimize impacts of human disturbance (e.g., fence, post, and patrol nesting sites) on beach nesting birds. Obtain necessary approvals from New Jersey Tidelands Council for management actions.	***Priority***	
	4m	Incorporate enforcement of pet restriction regulations into beach nesting bird plans and agreements and increase regular presence of state and federal (where appropriate) conservation officers and park rangers at beach nesting bird sites during the nesting season to enforce no-pet restrictions (e.g., dog ordinances)		
	4n	Protect beach nesting birds and minimize impacts on their reproductive success by incorporating limits on beach raking practices into beach nesting bird management agreements.	***Priority***	
	4o	Reduce and mitigate impacts of human activities on beach nesting birds through the development and implementation of beach management agreements with municipalities. Update existing agreements and continue to monitor and evaluate the success of the agreements and modify as appropriate.	***Priority***	
	4p	Reduce the impacts of human disturbance on red knots and other migratory shorebirds that use the intertidal zone of beaches and inlets by posting and/or fencing critical migratory sites, and developing management plans or policies that minimize human impacts.	***Priority***	
	4Q	Conduct investigations to establish appropriate buffer sizes to minimize disturbance from watercraft and pedestrians at colonial bird nesting sites.		

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	4r	Increase frequency of coast-wide aerial colonial waterbirds' surveys to once every other year to better determine population trends and distribution. Continue critical investigation of aerial survey technique through selected "ground truthing" and literature and peer review in order to increase efficacy of survey, minimize surveyor bias and error, and increase accuracy of trend data.	***Priority***	
	4s	Conduct pilot study and/or collaborate study with USFWS to reintroduce the northeastern beach tiger beetle at Holgate Unit of Edwin B. Forsythe NWR, to identify Island Beach State Park appropriate for a reintroduction and gauge likelihood of success of the reintroduction effort, and work with both the USFWS and National Park Service to implement reintroduction of northeastern beach tiger beetles at Sandy Hook Unit of Gateway National Recreation Area.		
	4T	Investigate carrying capacity of back-bay habitats for wintering greater and lesser scaup to help inform management actions and priorities.		
	4u	Investigate the role of locally available contaminants in the ecology of greater and lesser scaup to help inform management actions and priorities..		
	4V	Incorporate the recommendations and needs identified through the Marine Mammal Workshop (held April 17-19, 2006) for the conservation of NJ's marine mammals and sea turtles.	***Priority***	
	4W	Develop and implement conservation plans specific to New Jersey waters for whales, pinnipeds, seabirds (consistent with the North American Waterbird Conservation Plan), and sea turtles. Work with experts and and other government agencies to establish criteria to protect seabird species (near-shore migrants and pelagic birds) through regulatory measures.	***Priority***	
	4x	Conduct literature searches, surveys, and work with marine species researchers along the eastern coast to identify the threats facing whales, pinnipeds, porpoises, and sea turtles including ship strikes and commercial fishing gear. Assess the threats and determine the health of the Atlantic bottlenose dolphin and harbor porpoise populations through research and from expert opinion.		
	4Y	Investigate sound sources off the NJ coast to determine the potential acoustical threats to marine mammals. Develop and incorporate a plan into a marine mammal protection strategy, as recommended through the Marine Mammal Workshop (held April 17-19, 2006), to minimize the impacts off the NJ Coast within NJ state waters (3 nautical miles from the coastline).		
	4Z	Develop and implement management actions to enhance populations of special concern and rare fish.	***n/a***	Action deleted from meeting worksheet (repeat of action 4e). Action was a stakeholder priority, action 4e now priority.
	4aa	Reduce "by-catch" of listed and other critical species through regulatory or volunteer measures.	***Priority***	
	4bb	Investigate impacts to Atlantic sturgeon from commercial fishing practices and recommend restrictions on fishing gear and locational and/or seasonal restrictions.		
	4cc	Prevent declines in marine and estuarine fishes and pelagic bird populations by utilizing the NOAA Proactive Conservation Program's Species of Concern list to inform NJ's Delphi process when determining species that may warrant a state listing of endangered, threatened, or special concern.	***Priority***	

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	4dd	Work with other agencies or organizations to identify migratory routes and research, evaluate, and assess the effects of offshore energy projects (wind turbines) on avian and bat species and marine mammals, and the effects of wind turbines, tall buildings, radio towers and other "human-made" tall structures on avifauna and bats.	***Priority***	
	4ee	Reduce excessive predation on beach nesting birds through current management techniques (i.e. predator exclosures, electric fence), and on both beach and colonial nesting birds by implementing integrated wildlife damage management at important nesting sites. In addition, work with local municipalities and other landowners to develop policies and/or establish regulations that minimize the impacts of predators (e.g., raccoons, gulls, red fox, feral and free-roaming cats) on beach nesting birds.	***Priority***	
	4ff	Reduce watercraft impacts on colonial waterbirds. Use GIS measures, other remote sensing tools, and surveys to identify important foraging areas and habitats and establish, post, and enforce buffers to restrict watercraft and pedestrian use around nesting areas. Obtain necessary approvals from New Jersey Tidelands Council for management actions.	***Priority***	
	4gg	Establish a protected (fenced) nesting area on the oceanfront portion of the southern end of Island Beach State Park. Regulate off-road vehicle usage as necessary to protect birds that nest in the area.		Action was deleted from the Plan as biologists agreed it is specific and could be captured, if necessary, under other beach management actions.
	4hh	Conduct investigations of healthy and stranded marine mammals and sea turtles to determine diet, contaminat loads, general health, and parasite load.		
	4ii	Identify regulations per the Marine Mammal Protection Act (MMPA) currently not being enforced and enforce them. These regulations include but are not limited to restrictions on approach distance to right whales (a minimum 500 yards or 457.2 meters) and all other marine mammals (a minimum of 50 yards or 45.72 meters), and prohibits the harassment, hunting, capturing, and killing of marine mammals.	***Priority***	
	4JJ	Identify coastal marsh islands within Barnegat Bay where the lack of sufficient wrack mats limits nesting for black skimmer and common terns. Create “artificial” nesting mats through raking and redistribution of wrack material.		Action required clarification of when this management is appropriate (e.g., years when there were no or few winter storms and/or storms of minimal intensity). The action was revised to: "Identify coastal marsh islands within Barnegat...Create “artificial” nesting mats, <u>in years when needed,</u> through raking and redistribution of wrack material."

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
5	**Protect and enhance important and unique natural communities.**			
	5a	Protect and restore critical habitats and their associated wildife in Hereford Inlet , including at Stone Harbor Point, Champagne Island, and adjacent marsh islands and wetlands through athe development of a comprehensive management plan(s), by investigating the feasibility of incorporating Champagne Island into Cape May Wetlands Wildlife Management Area (WMA). and/or through the creation of a state regulated Marine Conservation Zone similar to the existing model used for Sedge Islands WMA to restrict human activities detrimental to wildlife or habitat.	***Priority***	
	5b	Protect and preserve critical habitats and their associated wildlife at Gateway National Recreation Area - Sandy Hook Unit from pressures of heavy recreational usage and redevelopement plans through close coordination with National Park Service and other agencies (i.e. USFWS) or partners in the developement of a comprehensive natural resource management plan and other policies that promote the significant importance of this site for wildlife.	***Priority***	
	5c	Continue stringent protection of Sedge Islands WMA through enforcement of existing state regulated marine conservation zone designation. Assess effectiveness of current designation of and determine if additional measures or regulations are needed to insure adequate protection of its wildlife and habitat. Implement appropriate changes.	***Priority***	
	5d	Monitor and maintain restored nesting and foraging areas (back dune ponds) created for piping plover and other beach nesting bird species at the South Cape May Meadows beach.		
	5e	Identify species, such as colonial waterbirds, peregrine, and osprey that would benefit from habitat restoration at the “Fish Factory” site. Work with appropriate agencies to develop and implement a habitat restoration plan.		
	5f	Determine species of priority for Malibu Beach WMA to help guide habitat restoration or management.		
	5g	Protect areas adjacent to and inclusive of to Edwin B. Forsythe NWR, Absecon WMA, Manahawkin WMA , and Great Bay WMA by acquiring (or facilitatating acquisition of) critical gaps in public land holdings and/or to buffer existing holdings; pursue acquisition or landowner agreements/easements to protect remaining private marsh islands within the Barnegat-Little Egg Harbor conservation zone, and by proposing the creation of a state regulated Marine Conservation Zone (in critical areas of the Brigantine-Great Bay zone) similar to the existing model used for Sedge Islands WMA to restrict human activities detrimental to wildlife or habitat.	***Priority***	
6	**Protect water quality.**			
	6a	Wetlands used as breeding sites should be protected from chemical contamination, siltation, eutrophication, and other forms of pollution/contamination that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality.	***Priority***	Stakeholders requested the action be revised to address protecting wetland habitats for wildlife whether used for breeding or not. The action was revised to: "Wetlands <u>used as wildlife habitat especially for breeding should</u> be…"
	6b	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters.		

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	6c	Maintain optimal biological buffers beyond regulatory requirements around wetlands, riparian, and floodplain areas and minimize destruction per the Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey. Encourage native plantings through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion.	***Priority***	
7	**Promote public education, awareness, and wildlife conservation.**			
	7a	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners.		Stakeholders requested that marine mammals and sea turtles be included in "wildlife." As such, a revised version of this action has been added to the Ocean conservation zone: "Develop and maintain educational brochures and posters and potential viewing opportunities of marine mammals and sea turtles for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners."
	7b	Create viewing opportunities for beach nesting birds at Cape May Point SP, Stone Harbor Point, Strathmere NA, Barnegat Lighthouse State Park , Island Beach State Park, and Corson's Inlet SP, beach nesting birds and shorebirds at North Brigantine Natural Area, colonial water birds at selected appropriate locations, such as the Ocean City Visitor's Center, and bayside street ends in Ventnor/Margate and Brigantine. Develop and install interpretive signage at wildlife viewing locations.	***Priority***	
	7c	Develop and encourage opportunities for eco-tourism in the coastal zone.		Revised to: Develop….coastal zone, including but not limited to the creation of viewing opportunities for [see action 7b for specific locations per zone], the creation of interpretive trails, and other wildlife viewing experiences."

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	7d	Present educational programs to local environmental organizations and community groups to promote understanding of threats to beach nesting birds, colonial water birds, osprey, and for other coastal species as needed, and to increase environmental stewardship.	***Priority***	Action needed clarification, as to whether it was about developing a curriculum or presenting it. As such, it has been revised to: "Develop and present educational programs to local environmental organizations, community groups, and schools to promote…"
	7e	Work with New Jersey Division of Parks and Forestry (NJDPF) to develop and enhance outreach opportunities with regards to beach nesting birds at state parks and natural areas, such as Cape May Point SP, Strathmere NA and Corson's Inlet SP.		
	7f	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are a major source of non-indigenous species that invade natural plant communities.	***Priority***	Stakeholders requested that an action be developed to prevent the sale of invasive plants by landscapers/ nurseries. Within the State-level Objectives (Section F of the Plan), an action exists regarding enacting legislation and the sale of ornamentals. Due the improbability of preventing sales, the action focuses on regulating sales. It has been revised to: "Enact legislation to regulate the sale of invasive plants (both native and exotic-native) for ornamental or restoration use. A list of NJ's invasive plants can be found within the appendix of the following web site..."
	7g	Develop targeted outreach brochures for pet owners to reduce the negative impacts to beach nesters and migratory and breeding shorebirds from domestic dog activity and free-roaming cats.	***Priority***	
	7h	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species.		
	7i	Develop an outreach brochure about northern diamondback terrapin biology, behavior, and threats, specifically targeting recreational (crab pot) crabbers.		Revised to: "Develop an outreach brochure about northern diamondback terrapin biology, behavior, and threats, specifically targeting recreational (crab pot) crabbers that can be distributed when they are applying for their crabbing licenses."

Goals (1-8)	Conservation Actions' Numbers	Atlantic Coastal Regional Landscape Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on March 29, 2007.
	7J	Develop brochures for and posters targeting watercraft users, including a mapping component to identify critical feeding and nesting habitats to avoid.	***Priority***	Revised to: Develop a brochure and/or poster which targets boat and jet-ski operators in order to help minimize their impact on wildlife. The outreach materials should include general information about what wildlife may be encountered, and the proper etiquette and appropriate practices for operating watercraft in the vicinity of wildlife and/or areas posted to protect wildlife.
	7k	Develop educational brochures, posters, and programs (targeted at both children and adults) that convey the threat posed by contaminants and persistent marine debris to marine life.	***Priority***	
8	**Assess large-scale habitat change every five years**			
	8a	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion. Focus within this region should be on beach erosion and and loss of coastal marshes and coastal bay islands.	***Priority***	

Attachment I: Report on Pinelands Regional Landscape Stakeholder Implementation Meeting (June 13, 2007)

DRAFT
Summary Report on the Wildlife Action Plan Pinelands Implementation Meeting

Environmental Law Institute
to
New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program

June 2007

Executive Summary

In February 2006, the Conserve Wildlife Foundation of New Jersey, in partnership with the New Jersey Department of Environmental Protection's Division of Fish and Wildlife, convened over 40 stakeholders from organizations that focus on statewide issues. The first statewide stakeholders' meeting was held at Duke Farms in Hillsboro, New Jersey. Their role was to discuss and select priority state-level goals from those identified in the New Jersey Wildlife Action Plan (Plan). Stakeholders identified 13 priority state-level goals, which can be found in Attachment A.

The second statewide Wildlife Action Plan Stakeholder Meeting was held on Thursday, April 6, 2006, also at Duke Farms. The primary goal of the meeting was to solicit stakeholder input into prioritizing state-level conservation strategies (actions) associated with the 13 priority state-level conservation goals identified at the first meeting. Participants from organizations that focus on statewide issues discussed and debated the state-level conservation strategies and provided their input on refining and prioritizing them. Seventy-two conservation strategies were selected as priorities. These can also be found in Attachment A.

On June 13, 2007, local stakeholders associated with the Pinelands Regional Landscape convened for the Pinelands Wildlife Action Plan Implementation Meeting held at the Richard Stockton College of New Jersey in Pomona, New Jersey. This was the fourth of five regional landscape meetings to be held throughout the state. The goal of this meeting was to identify a set of priority conservation actions to drive implementation of the state's Wildlife Action Plan in the Pinelands Regional Landscape.

Background

On June 13, 2007, the Conserve Wildlife Foundation of New Jersey (CWF) convened the Pinelands Wildlife Action Plan Implementation Meeting in partnership with the New Jersey Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW). The meeting was held at the Richard Stockton College of New Jersey in Pomona, New Jersey.

The meeting was the fourth of five Wildlife Action Plan landscape-level prioritization meetings. Thirty-six stakeholders who attended the meeting worked to identify a subset of forty-one (41) priority conservation actions among the eighty (80) conservation actions* identified in the Pinelands portion of the New Jersey Wildlife Action Plan. These forty-one (41) priority conservation actions will be used by DFW and its conservation partners to guide conservation efforts and resources toward implementation of the state's Wildlife Action Plan in the Pinelands Regional Landscape.

The New Jersey Wildlife Action Plan is a proactive plan to conserve wildlife before they become more rare and more costly to protect. The multi-scale plan identifies threats, conservation goals, and conservation actions at the state, landscape (5 regions; ocean is currently part of the Atlantic Coastal Regional Landscape), and sub-regional levels (identified as conservation zones within New Jersey's plan). New Jersey submitted its plan to the U.S. Fish and Wildlife Service on October 1, 2005, submitted its revised plan on July 26, 2006, and received final approval from the Service in September 2006.

The New Jersey Wildlife Action Plan is a living document and will undergo periodic revisions per comments and recommendations received by the public, through the regional stakeholder meetings, and as part of the adaptive management strategy outlined within the Plan. Digital copies of the Plan are available at the Division of Fish and Wildlife's Web site: www.state.nj.us/dep/fgw/ensp/waphome.htm

Summary of Pinelands Implementation Meeting

The objectives of the Pinelands Implementation Meeting were to convene regional leaders and stakeholders to:

- Provide stakeholders with a review the Pinelands Regional Landscape conservation goals and actions;
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions; and
- Seek stakeholder input on and identify forty-one (41) specific and broad-based* priority conservation actions for the Pinelands Regional Landscape.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

The Pinelands Regional Landscape section of the New Jersey Wildlife Action Plan include a number of goals, which focus on issues such as habitat conservation and protection, the conservation of populations of species of greatest conservation need, water quality, and public education and viewing opportunities. Each of the goals has a varying number of conservation actions associated with them that were developed to address the specific needs of each conservation zone (sub-regional level) within the Pinelands Regional Landscape. The implementation meeting was designed to:

- Provide local leaders and stakeholders with background on the objectives of the Wildlife Action Plan and its implementation;
- Provide a foundation for potential partnerships to implement the Wildlife Action Plan; and
- Seek stakeholder input to determine priority conservation actions for the Pinelands Regional Landscape.

In preparation for the working meeting, the Division of Fish and Wildlife (DFW) reviewed the conservation actions associated with the Pinelands Regional Landscape and indicate which actions the DFW considered priorities. The invited stakeholders were asked to review *in advance* the goals and actions associated with the Pinelands Region, as well as those actions pre-selected by DFW. The majority of the day was devoted to further discussion and clarification of conservation actions and final prioritization of the actions.

Introductory Sessions

Dennis Weiss, Dean of Natural Sciences and Mathematics at the Richard Stockton College of New Jersey, gave welcoming remarks. He expressed enthusiasm for hosting the meeting and emphasized the college's commitment to the science and conservation.

Dave Jenkins, Chief of ENSP, welcomed stakeholders and provided attendees with background on the purpose of the New Jersey Wildlife Action Plan and its basis in the Landscape Project. Jenkins stated that the plan is designed to be a blueprint for wildlife conservation for the full array of traditional and non-traditional conservation partners in the state, and is not solely the Division of Fish and Wildlife. His presentation focused on the conservation potential in New Jersey and he discussed the role and importance of partnerships in achieving conservation objectives in New Jersey.

Jessica Wilkinson, a senior policy analyst with the Environmental Law Institute, served as the facilitator, and gave an overview of the meeting objectives and agenda.

Dave Golden, a senior zoologist with the ENSP responsible for the Pinelands Regional Landscape, discussed the threats to the Pinelands Landscape habitat and wildlife and DEP's role in conservation in the region.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal <u>or</u> action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

Walter Bien, Director of Pinelands Research at Drexel University discussed the effects of wildlife on Pinelands plants and wildlife.

Emile DeVito, the Manager of Science and Stewardship for the New Jersey Conservation Foundation gave a presentation on the natural resource inventories and ecological restoration being conducted at the group's Franklin Parker Preserve.

Kris Schantz, a senior biologist with ENSP and coordinator of the New Jersey Wildlife Action Plan, gave a summary of the high-priority actions selected by DFW in advance of the meeting. She stated that for the Pinelands Region, the plan includes 8 broad-based* conservation goals and 100 broad-based* conservation actions associated with those goals. She informed participants that actions not selected as priority will remain in the Plan as an integral part of the Plan's success to achieve the desired objectives, but that the priority list helps provide guidance to our stakeholders when allocating limited resources for future conservation projects.

Finally, Herman Saatkamp, the President of Richard Stockton College of New Jersey greeted the group.

Facilitated Discussion

The majority of the remainder of the day was devoted to a discussion of the conservation actions associated with each of the region's conservation goals. Wilkinson led the participants through a discussion of each of the goals in turn. She asked participants to offer their comments on which of the conservation actions they considered to be of particular importance and which they felt were of lesser importance. In addition, participants were able to seek clarification on any of the actions that were unclear and add back in for further consideration actions not identified by DFW as priorities.

After a thorough discussion of the actions associated with each goal, the participants were asked to select a predetermined number of conservation actions they considered the highest priority for implementation within that goal. The number of actions participants were asked to select for each goal are found in Chart 1 below. In addition, ENSP staff assured the stakeholders that the potential edits to the actions discussed at the meeting would be reviewed and incorporated where feasible, and the actions would be revised to include measurable outcomes. The results of the participants' selection and the original actions with notes of revisions incorporated into the Plan can be found in Attachment D.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal <u>or</u> action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

	Number of conservation actions per goal
Goal 1	3
Goal 2	9
Goal 3	2
Goal 4	3
Goal 5	12
Goal 6	6
Goal 7	N/A – 1 by default
Goal 8	5

Chart 1: Number of conservation actions participants were asked to select for each of the conservation goals.

Concluding Remarks

Dave Jenkins gave closing remarks and thanked the participants for their time and contributions.

ATTACHMENTS:

A: Priority State-level Conservation Goals and Strategies (Actions)

B: List of Pinelands Regional Landscape Invitees and Attendees

C: Pinelands Wildlife Action Plan Stakeholder Meeting Final Agenda

D: Pinelands Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Attachment A: Priority State-level Conservation Goals and Strategies (Actions)

New Jersey Wildlife Action Plan
Priority State-level Goals and Strategies

Below you will find thirteen priority state-level goals identified at the First Wildlife Action Plan Stakeholder Meeting held on February 23, 2006, and the associated priority conservation strategies identified at the Second Wildlife Action Plan Stakeholder Meeting held on April 6, 2006. The goals have been categorized by the main topic and, where appropriate, the sub-topic as identified within the New Jersey Wildlife Action Plan. The goals and associated priorities have been arranged in categories and key words and concepts appear in bold to provide focus for the array of New Jersey partners in conservation, land managers and stewards, outreach initiatives, and residents interested in managing their lands to support native wildlife.

All of the goals and strategies have integrated public education and outreach and are to be implemented with an active adapted management strategy. The New Jersey Division of Fish and Wildlife hopes to receive continual feedback on implementation successes and failures that our state can integrate into the Wildlife Action Plan and implementation process.

Addressing National, Interstate, and Statewide Threats

Suburban sprawl and large-acre zoning

Goal: Identify and **protect** breeding, migration, and wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.

1. NJ Division of Fish and Wildlife (DFW) will collaborate with municipal and county planners to identify critical wildlife habitats for sensitive species and natural systems within their borders.
2. Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.
3. Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition, and land planning at all levels of government and non-government organizations.
4. Mitigate impacts of existing development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
5. Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
6. Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available.
7. DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include

clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.

8. Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
9. Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.

Goal: Maintain **connectivity of habitats** at the landscape scale.

1. Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
2. DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
3. Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
4. Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

Goal: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.

1. Reduce regulatory impediments to restoration and enhancement activities.
2. Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
3. Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
4. Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
5. Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
6. Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.

7. Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by GIS analysis.
8. Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
9. Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.

Goal: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.

1. Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
2. Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
3. Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
4. Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies, and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:.
    a. A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations.
    b. A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    c. A model ordinance for regulating feeding of wildlife.
    d. A model pet licensing ordinance.
    e. Mapping of colonies to evaluate impact on species of conservation concern.
5. Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
6. Create and implement a system for reporting and qualifying new locations of priority invasive species.
7. Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
8. Create implementation plan for Invasive Species Task Force recommendations when completed.

Unsustainable Land Management Practices on both Private and Conserved Lands and Water

Goal: Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

1. Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
2. Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
3. Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
4. Through surveys, increase the number of Category 1 streams justified by endangered and threatened species data.
5. Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using GIS and principles of landscape ecology as the foundation.

Direct Human Impacts on Native Wildlife and Ecosystem Health

Goal: Identify, protect, and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

1. Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
2. Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
3. Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
4. Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.

Development and Long-term Monitoring

Goal: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases to determine the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.

1. Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following:
   - o Breeding Bird Atlas
   - o Breeding Bird Survey
   - o Delaware Bay Migratory Shorebird Survey
   - o Bald Eagle Midwinter Survey
   - o Herptile Atlas
   - o Calling Amphibian Monitoring Program
   - o Fish Monitoring-Streams and Ponds
   - o Freshwater Mussel Atlas
   - o Mid-Winter Waterfowl Survey
   - o Atlantic Flyway Breeding Waterfowl Survey
   - o DFW Bobwhite Call-Count Survey
   - o Woodcock Call-Count Survey
   - o DFW Beaver-Otter Survey
   - o Migratory Game Bird Banding Programs
   - o Colonial Waterbird Survey
   - o Beach Nesting Bird Survey
   - o Site-specific Fish Monitoring Programs
2. Complete the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.
3. Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
4. Measure the enrollment acreage and effectiveness of backyard habitat management.
5. Through GIS, track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitor each site and evaluate the effectiveness of the management technique.
6. Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.

High Deer Densities

Goal: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific deer densities**.

1. Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
2. Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting,

Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.

3. Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
4. Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.
5. Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
6. Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.

Contaminants

Goal: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination**.

1. Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
2. Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
3. Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

Motorized Recreation Vehicles

Goal: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use**.

1. Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.

2. Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
3. Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
4. Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
5. Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.

Endangered, Threatened and Rare Wildlife

Goal: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protection of critical habitat, and habitat restoration and enhancement.

1. Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
2. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
3. Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.

Migratory Stopover and Important Bird Areas Planning

Goal: Identify, monitor, and **conserve key migratory corridors and stopover locations** for migratory birds.

1. Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
2. Annually monitor shorebird populations along the Delaware Bayshore stopover.
3. Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.

4. Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
5. Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers, and other "human-made" tall structures.
6. Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.

Review of Wildlife Action Plan

Goal: Ensure that **conservation activities** of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan (Plan).

1. The most current version of the Plan will be continually available for review on the Division of Fish and Wildlife's Web site with an open invitation to submit comments.
2. Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the Endangered and Nongame Species Advisory Committee (ENSAC), and a wildlife summit in which adaptive management will be built into the revision.
3. DFW will work with federal, state, county, municipal, and private (NGOs) land managers to incorporate the goals and strategies of the Plan into current management plans by the first formal review in 2011.
4. Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the ENSAC, the Fish and Game Council, and the Marine Fisheries Council.

Attachment B: List of Pinelands Regional Landscape Invitees and Attendees

ATTACHMENT B

Pinelands Regional Landscape Stakeholder Meeting: Wildlife Action Plan

List of Attendees

First name	Last name	Organization	Invited	Attended
Fred	Akers	Great Egg Harbor Watershed Association	X	X
Robert	Allen	The Nature Conservancy-NJ Chapter, Delaware Bayshores Office	X	
James	Applegate	ENSP Advisory Committee	X	
Larry	Baier	DEP-Water Monitoring & Standards	X	
Lisa	Barno	NJDEP-Division of Fish and Wildlife, FWF, Chief	X	
Jim	Barresi	NJDEP-Division of Parks and Forestry	X	
Sandy	Batty	ANJEC	X	
Gena	Berg	Burlington Co. Resource Conservation Dept.	X	
Walt	Bien	Drexel University, Department of Bioscience and Biotechnology	X	X
Laurie	Brewster	The Nature Conservancy-NJ Chapter, Delaware Bayshores Office		X
Ben	Brickner	Office of the Governor	X	
Barbara	Brummer	The Nature Conservancy-NJ Chapter	X	
John	Bunnell	Pinelands Commission	X	X
Joanna	Burger	ENSP Advisory Committee	X	
Robert	Cartica	NJDEP-Division of Parks and Forestry, Natural Lands Management	X	
Terry	Caruso	NJDEP-Green Acres	X	X
Paul	Castelli	NJDEP-Division of Fish and Wildlife, BWM	X	X
Michael	Catania	Conservation Resources, Inc.	X	
Dave	Chanda	NJDEP-Division of Fish and Wildlife, Director	X	
Beth	Ciuzio	NJ Audubon Society	X	X
Kathleen	Clark	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Cynthia	Coritz	NJDEP-Division of Parks and Forestry, Bass River State Forest		X
Amy	Cradic	NJDEP, Asst. Commissioner	X	
Michael	Davenport	Conserve Wildlife Foundation of NJ	X	
Joe	DeMartino	Ducks Unlimited	X	
Emile	DeVito	The NJ Conservation Foundation-Bamboo Brook and ENSP Advisory Committee	X	X
Donna	Drewes	Municipal Land Use Center	X	
Bryon	DuBois	Trident Environmental Consultants	X	

First name	Last name	Organization	Invited	Attended
Mariana	DuBrul	Pinelands Commission	X	
Michael	Dunphy	U.S. Army - Fort Dix, Environmental Division, IMNE-DIX-PWE	X	X
Rick	Dutko	NJDEP-NJ Natural Heritage Program, Office of Nat. Lands Mgmt.	X	
Ruth	Ehinger	NJDEP-Coastal Management Program	X	
Troy	Ettel	NJ Audubon Society	X	
Daniel	Ferrigno	NJDEP-Division of Fish and Wildlife, BLM	X	
Jose	Fernandez	NJDEP-Division of Parks and Forestry	X	
Lynn	Fleming	NJDEP-Division of Parks and Forestry	X	
John	Flynn	NJDEP-Green Acres	X	
Jane	Galetto	ENSP Advisory Committee	X	
Dave	Golden	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Amy	Green	Amy S. Green Environmental Consultants	X	
Brian	Henderson	Conserve Wildlife Foundation of NJ		X
Dan	Hernandez	Stockton State College	X	
Larry	Herrighty	NJDEP-Division of Fish and Wildlife, BWM, Chief	X	
Damian	Holynskyj	NJDEP-Division of Fish and Wildlife, Environmental Review		X
George	Howard	NJ State Federation of Sportsmen's Clubs	X	
Lisa	Jackson	NJDEP, Commissioner	X	
Christopher	Jage	New Jersey Conservation Foundation	X	
Dave	Jenkins	NJDEP-Division of Fish and Wildlife, ENSP, Acting Chief	X	X
Elizabeth	Johnson	American Museum of Natural History	X	
Russell	Juelg	Pinelands Preservation Alliance	X	
Carole	Kandoth	NJDEP-Division of Fish and Wildlife, BWM	X	X
Tom	Keck	NJDEP-Division of Parks and Forestry	X	
Michal	Klemens	Wildlife Conservation Society	X	
Jon	Klischies	NJ Forest Service	X	X
Kim	Laidig	Pinelands Commission	X	
Jan	Larson	ENSP Advisory Committee	X	
Rick	Lathrop	Rutgers University-CRSSA Lab and ENSP Advisory Committee	X	
Jay	Laubengeyer	The Nature Conservancy-NJ Chapter	X	
Theresa	Lettman	Pinelands Preservation Alliance	X	X
Lynn	Maun	Great Egg Harbor Watershed Association	X	X
Mark	Mauriello	NJDEP-Division of Land Use	X	

ATTACHMENT B (continued)

First name	Last name	Organization	Invited	Attended
Lorraine	McCay	NJDEP-Division of Parks and Forestry, Wharton State Forest	X	X
Maura	McManimon	NJ Office of Smart Growth	X	
Flo	McNeily	NJDEP-Division of Parks and Forestry, Belleplain State Forest		X
Erica	Miller	Tri-State Bird Rescue	X	
David	Mizrahi	NJ Audubon Society	X	
Carleton	Montgomery	Pinelands Preservation Alliance	X	
Dan	Mott	Burlington Co. Dept. Resource Conservation	X	
Al	Newman	Trident Environmental Consultants		X
Tom	Niederer	NJ Forestry Association	X	
Margaret	O'Gorman	Conserve Wildlife Foundation of NJ, Executive Director	X	
Tony	Petrongolo	NJDEP-Division of Fish and Wildlife, BLM, Chief	X	X
Laurie	Pettigrew	NJDEP-Division of Fish and Wildlife, BLM	X	X
Carlo	Popolizo	USFWS-NJ Field Office	X	
Ray	Porutski	NJDEP-Division of Fish and Wildlife, BLM	X	
Emily	Pugliese	NJDEP-Division of Land Use	X	X
Howard	Reinert	The College of NJ, Department of Biology	X	
Lee	Rosensen	ENSP Advisory Committee	X	X
Kris	Schantz	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Annette	Scherer	USFWS-NJ Field Office	X	X
Eric	Shrading	USFWS-NJ Field Office	X	
Dale	Schweitzer	ENSP Advisory Committee	X	
Jim	Sciascia	NJDEP-Division of Fish and Wildlife, I & E, Chief	X	
James	Shissias	ENSP Advisory Committee	X	
Carol	Slocum	Richard Stockton College of NJ	X	
Ronald	Smith	Drexel University, Department of Bioscience and Biotechnology	X	X
John	Staples	USFWS-NJ Field Office	X	
Eric	Stiles	NJ Audubon Society	X	
John	Stokes	Pinelands Commission	X	
Kristen	Symanski	NJDEP-Division of Land Use	X	X
Terry	Terry	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Larry	Torok	NJDEP-Division of Land Use	X	X-alt representative for DLU
Jon	Wager	Conservation Resources, Inc.	X	

ATTACHMENT B (continued)

First name	Last name	Organization	Invited	Attended
Kathleen	Walz	NJDEP-NJ Natural Heritage Program, Office of Nat. Lands Mgmt.	X	
Jay	Watson	NJDEP-Commissioner's Office, Deputy Commissioner	X	
Donald	Wilkinson	NJDEP-Division of Fish and Wildlife	X	
Jessica	Wilkinson	Environmental Law Institute	X	X
Robert	Williams	Land Dimensions Engineering	X	X
Andy	Windisch	NJDEP-Division of Parks and Forestry, Natural Lands Management	X	
Peter	Winkler	NJDEP-Division of Fish and Wildlife, ENSP		X
Robert	Zampella	Pinelands Commission	X	
Robert	Zappalorti	Herpetological Associates	X	
George	Zimmerman	Richard Stockton College of NJ	X	X
Adam	Zellner	NJDEP-Commissioner's Office	X	

Attachment C: Pinelands Wildlife Action Plan Stakeholder Meeting Final Agenda

ATTACHMENT C

CONSERVE WILDLIFE
FOUNDATION OF NEW JERSEY

Wildlife Action Plan
Pinelands Regional Landscape Implementation Meeting
Wednesday, June 13, 2007
9:00 a.m. to 4:30 p.m.
Richard Stockton College of New Jersey
Townsend Residential Life Center - TRLC

Meeting Objectives

- Review Pinelands Landscape goals and conservation actions
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions
- Seek stakeholder input on selection of priority conservation actions

Meeting Agenda

8:30 a.m. Continental Breakfast

9:00 a.m. Welcome and Opening Remarks
- Dennis Weiss, Dean, Natural Sciences and Mathematics
  Richard Stockton College of New Jersey

9:10 a.m. Introduction to the New Jersey State Wildlife Action Plan (WAP)
- Dave Jenkins, Acting Chief, Endangered and Nongame Species Program
  Division of Fish and Wildlife, Department of Environmental Protection
- Questions and Answers (5 minutes)

9:40 a.m. Overview and Introductions
- Jessica Wilkinson, Environmental Law Institute

9:50 a.m. Threats to the Habitat and Wildlife of the Pinelands Regional Landscape
- Dave Golden, Senior Zoologist, Endangered and Nongame Species Program
  Division of Fish and Wildlife, Department of Environmental Protection

10:05 a.m. Wildfire Effects on Pinelands Plants and Wildlife

- Walter Bien, Ph.D., Director of Pinelands Research, Drexel University
- Questions and Answers (5 minutes)

10:30 a.m. Break

10:45 a.m. Natural Resource Inventories and Ecological Restoration at the Franklin Parker Preserve

- Emile DeVito, Ph.D., Manager of Science and Stewardship, New Jersey Conservation Foundation
- Questions and Answers (5 minutes)

11:05 a.m. Summary of WAP Prioritization Process

- Kris Schantz, Senior Zoologist, Endangered and Nongame Species Program Division of Fish and Wildlife, Department of Environmental Protection

11:25 a.m. Stockton College Greeting

- Herman Saatkamp, Ph.D., President
  Richard Stockton College of New Jersey

11:40 a.m. Facilitated Discussion of Priority Actions (continued)

12:30 – 1:30 p.m. Lunch

1:30 p.m. Facilitated Discussion of Priority Actions (continued)

3:15 p.m. Break

3:30 p.m. Selection of Priority Actions

4:00 p.m. Wrap-Up & Next Steps

- Dave Jenkins, Acting Chief, Endangered and Nongame Species Program

4:30 p.m. Meeting Adjourns

Attachment D: Pinelands Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
1	**Protect and restore characteristic Pinelands communities**			
	1a	Restore the dynamic nature of this ecosystem by developing management plans for state lands that incorporate the needs of Pinelands plants and animals based on the historic temporal and spatial patch diversity that once existed in the Pinelands.	***PRIORITY***	It was suggested that the word "historic" is not clear; there is a need to establish a reference point in time or otherwise provide clarity to this action. As such, this action was revised to "Restore the dynamic nature of this ecosystem by developing management plans for state lands which incorporate the needs of Pinelands plants and animals and generate the spatial patch diversity needed by species within this community."
	1b	Use GIS measures, other remote sensing tools, and surveys to identify rare and unique Pinelands plant communities and increase protection for these areas areas through acquisition, proper management, or increased enforcement.		The greatest concern regarding this action is whether or not there is a use for geographic information system (GIS)-based data in the homogeneous Pinelands. However, because 1) the Pinelands Commission already uses GIS data on rights-of-way and other areas and 2) the action states "other remote sensing" and the use of "surveys" it was determined that this action should remain in the Pinelands portion of the Wildlife Action Plan (Plan).
	1c	Research and implement the different management techniques (e.g., ecologically-based forestry activities, prescribed burns) that might be used to mimic the historic role of fire and other natural disturbances in shaping this ecosystem.	***PRIORITY***	Discussion of this action focused on the potential need to clarify that "research" should be "long-term research" and that prescribed burns should include growing season burns. Because there is place for both short- and long-term research regarding habitat management, "research" remained as is. The use of the phrase "prescribed burns" does not exclude growing season burns. Those desiring to conduct such burns would need to go through the appropriate channels and the NJ DEP. Therefore, in an effort to refine this action, it has been revised to: "Research different management techniques (e.g., ecologicall based forestry activities, prescribed burns) that might be used to mimic the historic role of fire and other natural disturbances in shaping this ecosystem. Implement appropriate management actions in areas where natural disturbances, such as wildfire, have been precluded."
	1d	Work with the Office of Natural Lands Management and the New Jersey Forest Fire Service to determine the historic and future role of fire in the creation and management of unique Pinelands communities.		This action excluded other bureaus/ offices within the Division of Parks and Forestry. As such, this action was revised to be more inclusive: "Work with the Division of Parks and Forestry including the Office of Natural Lands Management, the Forest Fire Service, and Forest Service to determine the historic and future role of fire in the creation and management of unique Pinelands communities."
	1e	Develop, implement, and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) that favor the establishment and persistence of native, early-successional Pinelands communities.		
	1f	Identify, enhance, and restore Atlantic white cedar communities within the Pinelands for timber rattlesnakes, Pine Barrens treefrogs, black-throated green warblers, red-shouldered hawks, barred owls, and Cooper's hawks.	***PRIORITY***	Pinelands Commission representative reported that they would not use the Pine Barrens treefrog as a justification since these species use marginal habitats as well. Therefore, Pine Barrens treefrog was eliminated from this action.

Goals (1-8)	Conservation Actions' Numbers		PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
2	**Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and species**				
	2a	**Forest**			
		2a-1	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions.	***PRIORITY***	
		2a-2	Use GIS measures and surveys to identify and assess critical core forests for forest-interior songbirds, forest raptors (red-shouldered hawk, barred owl, long-eared owl), forest-dwelling bats, Pine snakes, corn snakes, timber rattlesnakes, and bald eagles. Take action to minimize habitat loss and maintain large core areas by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, forest management and stewardship plans. Maintain information in the Landscape Project and Biotics database, and provide this information to the Pinelands Commission.	***PRIORITY***	Action was revised to: "Use GIS measures, other remote sensing tools, and surveys to…"
		2a-3	Use GIS measures, other remote-sensing tools, and wildlife surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g. regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans.		
		2a-4	Manage forests on a regional scale to provide a mix of seral (successional) stages for a wide range of forest-dwelling species (e.g., woodland raptors, pine snakes, corn snakes, Pine warbler, black-throated green warbler, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. These seral stages include but are not limited to: mature and near-mature forests with large trees, > 80% canopy cover and an uneven-age structure; mature forests with 65-85% canopy closure and structural diversity; pine-oak savanna with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar).	***PRIORITY***	
		NEW	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing healthy Pinelands forests.	***PRIORITY***	In a later discussion, it was determined that a separate action focusing on the development of BMPs for Pinelands forests should be developed. As such, this action was created and since it was not part of the original prioritization process, but was a main topic of discussion among stakeholders, it was identified as a priority action.
	2b	**Early-successional fields**			
		2b-1	Encourage landowners to delay mowing to allow grassland-dependent species to successfully breed; this can be accomplished through public education and incentive programs. Continue to evaluate the effectiveness of delayed mowing for grassland-dependent species including birds, invertebrates, reptiles, and amphibians.		

Goals (1-8)	Conservation Actions' Numbers		PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
		2b-2	Research different management techniques to understand the appropriateness of prescribed burning, mowing, and other methods for maintaining suitable habitat for species dependent on early successional habitats.	***PRIORITY***	Stakeholders asked for this action to include other mechanical means of creating and maintaining early successional habitats. However, the action states "other methods" so the action was revised to the following: "Research different techniques for maintaining suitable habitat for species dependent on early successional habitats (e.g., prescribed burning, mowing, brush-hogging, and other methods)."
		2b-3	Use GIS measures and surveys to identify critical scrub-shrub (areas with >25% woody vegetation <20 feet in height) habitats, assess their condition for nesting birds (golden-winged warbler and woodcock) and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create them.		
		2b-4	Use GIS measures and wildlife surveys to identify grassland habitats (areas with >75 % herbaceous and <25% woody vegetation), assess their condition for nesting grassland birds and other wildlife, and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management (timing restrictions for mowing, prescribed burning) strategies to maintain and enhance these habitats in perpetuity. Focus on habitat patches that can be managed at a size and scale that is similar to historic patch size of this habitat type as being researched by the Pinelands Commission as part of their "Right-of-way Project."		Some stakeholders were concerned with the term "grassland" with reference to habitat within the Pinelands Region. However, there are areas within the Pinelands where this action would apply. This action was deliberately developed to address such places.
		2b-5	Develop, implement, and evaluate best management practices (BMPs) for maintaining and enhancing early succession habitats which will improve habitat quality for grassland- and scrub-shrub-dependent species. BMPs will be implemented on large patches such as the grasslands (areas with >75 % herbaceous and <25% woody vegetation) on public lands, the Atlantic City Airport, Fort Dix Military Installation, and at Lakehurst Naval Station, and early succession habitats along utility line rights-of-way (scrub-shrub).	***PRIORITY***	
		2b-6	Maintain existing early succession habitats and work to establish new grassland and scrub-shrub habitats along utility line rights-of-way and in association with fire breaks and fuel breaks where appropriate. Creation of these habitats should be planned so they benefit grassland- and scrub-shrub-dependent species. Manage some rights-of-way for scrub-shrub species with small area requirements.		
	1c	**Aquatic, Wetland, riparian, and floodplain**			
		2c-1	Increase the effective size and connectivity of wetlands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures and surveys to identify important corridors that connect wetland habitats and target these areas for acquisition or work with public and private landowners to enhance and restore the corridors.		
		2c-2	Use GIS measures and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl), forest-interior songbirds, timber rattlesnakes, and Indiana bats. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans.		

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions		Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
		2c-3	Protect habitat for fish by performing QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and plotting distributions of special concern fish species (as identified by the Delphi process), and integrate those data into the Biotics database.		
		2c-4	Locate potential vernal pools through aerial imagery and surveys and integrate certified vernal pool data into the DEP regulations database and Landscape Project.	***PRIORITY***	
		2c-5	Identify threats to vernal pools through systematic monitoring and devise strategies to protect vernal pool dependent species.	***PRIORITY***	
	Broad-based habitat actions				
	2d	Revise existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available.		***PRIORITY***	
	2e	Develop a species occurrence area of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). As GIS data layers become available, develop a predictable model of Indiana bat summer habitat.			
	2f	Reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat value for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure.		***PRIORITY***	
3	**Protect water quality and the availability of wetland habitats.**				
	3a	Maintain optimal biological buffers beyond regulatory requirements around wetlands, riparian, and floodplain areas and minimize destruction per the Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey. Encourage native plantings through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion.		***PRIORITY***	Stakeholders agree that ecologically [we] know that wetland encroachment negatively impacts the quality of the wetland and the species that depend on it. In addition, some stakeholders felt the second statement needed refinement or clarification because they did not think it was appropriate for this action as is. As such, the action was revised to: "Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion."
	3b	Prevent runoff and sedimentation by maintaining riparian areas through stream bank restoration efforts.		***PRIORITY***	
	3c	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters.			
	3d	Maintain water chemistry/ water quality important for species native to the Pinelands. For example, maintain low pH waters important for breeding populations of Pine Barrens treefrogs and carpenter frogs.			

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
4	**Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant**			
	4a	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the level of impact on the ecosystem.	***PRIORITY***	Revised to: "Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the potential level of impact on the ecosystem and species of conservation concern and the liklihood of success."
	4b	Work with appropriate government agencies to survey for and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the southern pine beetle, orange-striped oakworm, gypsy moth, and oak lace bug. Take appropriate control methods to reduce tree damage and limit the spread of infestations, provided such methods avoid excessive direct or indirect harm to non-target species.	***PRIORITY***	Some stakeholders would like to see a separate action specifically for Atlantic white cedar if there is an invasive insect targeting this forest type given its rarity. In addition, since action "4b" (the work) can't be done without "4a" (identifying the sites), can these actions be lumped? --- With regards to the first request, there is some concern over singling out Atlantic white cedar over other community types; to do so, we'd need to address each community in a separate action. With regards to the second request, there is sound reason in first identifying and prioritizing sites and then working to resolve the problem. Given some agencies or organizations may begin this process before others, lumping the actions may exclude them from moving forward as one agency may identify sites and another conduct the actual action. This action has been revised to: "Work with appropriate government agencies to survey for and monitor the spread of invasive insect species that jeopardize the health of Pinelands forest types (e.g., Atlantic white cedar, pitch-pine lowlands, oak-pine uplands, and others."
	4c	Work with public and private landowners and managers and regulatory agencies to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants.	***PRIORITY***	Revised to: "…non-indigeneous plants and animals…"
	4d	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective.		
	4e	Work with the Division of Fish and Wildlife to identify areas (primarily refuge areas where hunting is prohibited) where deer densities exist at unhealthy levels and develop a strategy to reduce deer numbers and maintain them at acceptable levels that encourage natural forest regeneration.		Stakeholders questioned the validity of this action in the Pinelands portion of the Wildlife Action Plan given few could think of an actual "refuge" where deer persist. However, give it does not negatively impact the Plan to have the action, it will remain in this section of the Plan but as you will notice, the stakeholders did not select this as a priority.

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	4f	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer.		Although DFW deer biologist stated that this action has little effect on the Pinelands Region as the Pinelands has the lowest deer density in the state, it was determined that the action would remain in the Plan as it does not negatively impact the Plan.
5	**Prevent, stabilize and/or reverse declines of endangered, threatened, and special concern species.**			
	5a	Evaluate and assess impacts of wind turbines to populations of breeding and migratory bats and birds.	***PRIORITY***	Concerns over this action revolved around 1) the misinformation that no wind turbines are proposed for the Pinelands and 2) that some stakeholders don't want the wind turbines in the Pinelands.--- With regards to the first concern, there are proposals for wind turbines in the Pinelands that are under review by the NJ DEP; the second concern is an opinion and not for debate within the Plan. However, upon further discussion within the Endangered and Nongame Species Program (ENSP), it was determined that the action would be revised as follows: "Evaluate and assess the potential impacts of wind turbines to populations of breeding and migratory birds and bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on birds and bats."
	5b	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals).		
	5c	Work with the Pinelands Commission to investigate terrestrial habitat requirements for the northern pine snake and develop a predictive model to identify pine snake habitat and habitat use at critical life stage sites (e.g., nesting areas) that require additional protection from collection, disturbance, and destruction. Such a model could be a fundamental tool used in the Pinelands Commission's evaluation of development applications.		
	5d	Work with local agencies and stakeholders to develop and implement proactive habitat management/conservation plans for Pine Barrens treefrog. Such a plan should include ongoing surveys for this species to identify healthy populations and a scheme to protect habitats to connect populations and maintain viable metapopulations.		
	5e	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Division of Parks and Forestry to designate riding areas and BMPs should be developed.	***PRIORITY***	
	5f	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implement methods to reduce roadside mortality of wildlife (e.g. wildlife underpasses, road closures).	***PRIORITY***	
	5g	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including the causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, and how water quality degradation and contaminants affect rare species.	***PRIORITY***	

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	5h	Develop and implement habitat conservation goals that will meet and maintain the recovery needs of endangered and threatened wildlife populations, particularly for those restricted to the Pinelands region. These include guidelines for forest silviculture on public and private lands to enhance forest health and habitat diversity. This will include working with regulators to maintain water quality of breeding ponds (low pH) and protect suitable buffers on ponds, ongoing surveys for species of conservation concern to identify healthy populations, and a scheme to protect habitats that connect populations and maintain viable metapopulations.	***PRIORITY***	
	5i	Work with public and private landowners and managers with significant grassland bird and scrub-shrub/open field bird populations, bald eagle, northern pine snake, Pine Barrens treefrog, cavity-nester, freshwater wetland bird, and raptor populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs.		
	5J	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999).		
	5k	Develop and implement management actions to enhance populations of special concern and rare fish.	***PRIORITY***	
	5L	Determine carrying capacity of pinelands wetlands for breeding wood ducks, including available nest cavities and breeding season food resources. Use this data to develop appropriate management strategies (e.g., installation of wood duck boxes or habitat management to enhance and support targeted native invertebrate populations).		
	5m	Research the effects of prescribed burning and habitat fragmentation on corn snakes, northern pine snakes, and timber rattlesnakes and work with foresters to develop effective forest management and stewardship plans to increase or maintain the habitat quality for these species in the Pinelands.	***PRIORITY***	Revised action to: "Research the effects of current prescribed burning practices and habitat fragmentation on corn snakes, northern pine snakes, and timber rattlesnakes and work with foresters to develop and implement effective forest management and stewardship plans to increase or maintain the habitat quality for these species in the Pinelands."
	5n	Manage silver-bordered fritillary habitat for proliferation of host vegetation and to retard succession where appropriate.		
	5o	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant elevated or listed status among taxa that has not undergone Delphi review (e.g., fish, moths).		
	5p	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats for breeding, migratory, and wintering waterfowl and assess their condition for maintaining populations. Work with the DFW, Bureau of Wildlife Management to develop protection strategies to maintain and enhance existing waterfowl habitat.		One stakeholder expressed his concern over the ambiguity surrounding beaver activity. Beavers can create/enhance waterfowl habitat but destroy habitat for other species. How do we capture this? --- These comments are correct and difficult to capture within one or two actions. We decided to let the action remain as is and that this issue would need to be addressed on a site by site basis. For example, an area with known bog turtle habitat (a federal listed species), would need to exclude beaver activity from the site. An area considered waterfowl foraging or congregation sites would have a different management approach.
	5Q	Identify and implement best management practices for bald eagle and forest-interior passerine and raptor habitat.		Revised to include migratory stopovers: "Identify and implement best management practices for bald eagle, forest-interior passerine and raptor habitat, and migratory stopover areas "
	5r	DEP to work with partners in conservation to establish a policy to control damage to native wildlife populations resulting from feral and free-ranging domestic cats on public lands.	***PRIORITY***	

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	5s	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement of critical sites (nesting, basking, gestation, dens), particularly those used by corn snakes, northern pine snakes, and timber rattlesnakes, to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes, and Pine Barrens treefrog) and human disturbance (off-road vehicles).	***PRIORITY***	Added Division of Parks and Forestry Bureau of Law Enforcement to list of partners.
	5t	Recruit and educate local law enforcement of endangered species laws by developing and hosting a training seminar. Develop a partnership between local law enforcement, USFWS Special Agents, and the NJ Division of Fish and Wildlife's Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (northern pine snakes, corn snakes, bog turtles), persecution (timber rattlesnakes), and human disturbance (off-road vehicles).		
	5u	Protect wildlife species of special concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all critical wildlife habitats, public and private conservation lands.	***PRIORITY***	
	5V	Conduct surveys to find more information about species and management requirements for secretive marsh nesting birds.	***PRIORITY***	
	5W	Research the habitat requirements for forest passerines and woodland raptors, timber rattlesnakes, corn snakes, northern pine snakes, a Indiana bats, when appropriate. Research and experimentally implement planned silviculture practices to develop guidance for enhancing forests for these species and species suites.	***PRIORITY***	
6	**Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species.**			
	6a	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.	***PRIORITY***	
	6b	Conduct concentrated field sampling for listed or special concern fish species in areas indicated by Fish Track Database queries and incorporate data into the Biotics database.		
	6c	Conduct surveys in appropriate habitats and work with partners in conservation to determine species distributions and identify critical habitats and protection needs for dragonflies and damselflies, timber rattlesnakes, corn snakes, northern pine snakes, Pine Barrens treefrog, silver-bordered fritillary, arogos skipper, and dotted skipper.	***PRIORITY***	
	6d	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are prese Repeat surveys every four years to monitor populations. Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species.		
	6e	Determine baseline abundance and establish long-term monitoring programs for wildlife of greatest conservation need (e.g., develop population estimates for rare Pineland species and conduct range-wide surveys every four years).	***PRIORITY***	
	6f	Conduct breeding waterfowl surveys annually to monitor population trends.		
	6g	Continue volunteer-based summer bat concentration surveys to locate important maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys.	***PRIORITY***	

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	6h	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies and conduct state-wide sampling (e.g., mist netting) to determine distribution, range, and habitat use of summer bats. Long-term sampling of forest dwelling bat species should be conducted to determine population trends and species response to changes in habitats.		
	6i	Research population distribution of northern diamondback terrapin to determine critical areas for protection. Use GIS measures, other remote sensing tools, and surveys to identify northern diamondback terrapin key crossing areas and work with local or state transportation agencies to erect turtle barriers and to develop a model of suitable northern diamondback terrapin nesting areas.		
	6J	Conduct surveys for the eastern mud salamander at historic sites and evaluate its use of wetlands and wetland buffers.		
	6k	Identify and research water quality parameters for endangered, threatened, and native Pinelands species. Assess impacts and incorporate into BMPs.	***PRIORITY***	
	6L	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, common nighthawks), northern saw-whet owls, and eastern screech-owls.	***PRIORITY***	
7	**Assess large-scale habitat change (every five to 10 years).**			
	7a	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.	***PRIORITY***	
8	**Promote public education, awareness, wildlife conservation, and participation in habitat restoration efforts on private land.**			
	8a	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies.		
	8b	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control.		
	8c	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities.	***PRIORITY***	
	8d	Develop and encourage nature tourism opportunities in the Pinelands including wildlife viewing sites, interpretive signage highlighting unique ecosystems/habitats, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats.	***PRIORITY***	
	8e	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, etc; work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations.	***PRIORITY***	Added "web pages" to list of possible outreach methods.

Goals (1-8)	Conservation Actions' Numbers	PINELANDS Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on January 10, 2007.
	8f	Develop brochures and posters about management practices for the public and for private landowners with significant grassland bird and scrub-shrub/open field bird populations, bald eagle, northern pine snake, Pine Barrens treefrog, cavity-nester, freshwater wetland bird, and raptor populations.		Stakeholders were interested in incorporating the secondary benefits of management practices. As such, the action has been revised to: "Develop educational brochures and posters describing habitat management practices that can be carried out on both private and pubic lands. These brochures and posters should focus on the management, enhancement, and creation of habitat for early success ional species and include descriptions of various forestry management techniques; the primary and secondary benefits of prescribed burning should be highlighted."
	8g	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program.	***PRIORITY***	
	8h	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species.		
	8i	Develop a field guide to NJ's freshwater mussel species to assist in promoting public education and increase awareness of New Jersey's native freshwater mussel fauna.		
	8J	Develop educational programs, brochures and posters for the public regarding tolerance and protection of timber rattlesnakes and their habitat.	***PRIORITY***	

Attachment J: Report on Delaware Bay Regional Landscape Stakeholder Implementation Meeting (September 12, 2007)

DRAFT
Summary Report on the Wildlife Action Plan Delaware Bay Implementation Meeting

Environmental Law Institute
to
New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program

September 2007

Executive Summary

In February 2006, the Conserve Wildlife Foundation of New Jersey, in partnership with the New Jersey Department of Environmental Protection's Division of Fish and Wildlife, convened over 40 stakeholders from organizations that focus on statewide issues. The first statewide stakeholders' meeting was held at Duke Farms in Hillsboro, New Jersey. Their role was to discuss and select priority state-level goals from those identified in the New Jersey Wildlife Action Plan. Stakeholders identified 13 priority state-level goals, which can be found in Attachment A.

The second statewide Wildlife Action Plan Stakeholder Meeting was held on Thursday, April 6, 2006, at Duke Farms. The primary goal of the meeting was to solicit stakeholder input into prioritizing state-level conservation strategies (actions) associated with the 13 priority state-level conservation goals identified at the first meeting. Participants from organizations that focus on statewide issues discussed and debated the state-level conservation strategies and provided their input on refining and prioritizing them. Seventy-two conservation strategies were selected as priorities. These can also be found in Attachment A.

On September 12, 2007, local stakeholders associated with the Delaware Bay Regional Landscape convened for the Delaware Bay Wildlife Action Plan Implementation Meeting held at the New Jersey Audubon's Center for Education and Research in Goshen, Cape May County. This was the fifth of five regional landscape meetings held across the state. The goal of this meeting was to identify a set of priority conservation actions to drive implementation of the state's Wildlife Action Plan in the Delaware Bay Regional Landscape.

Background

On September 12, 2007, the Conserve Wildlife Foundation of New Jersey (CWF) convened the Delaware Bay Wildlife Action Plan Implementation Meeting in partnership with the New Jersey Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW). The meeting was held at New Jersey Audubon's Center for Education and Research in Goshen, Cape May County.

The meeting was the third of five Wildlife Action Plan landscape-level prioritization meetings. Twenty-nine (29) attendees including nineteen (19) stakeholders (non-DFW personnel), who attended the meeting, worked to identify a set of fifty-five (55) priority conservation actions among the 104 conservation actions* identified in the Delaware Bay portion of the New Jersey Wildlife Action Plan. These fifty-five (55) priority conservation actions will be used by DFW and its conservation partners to guide conservation efforts and resources toward implementation of the state's Wildlife Action Plan in the Delaware Bay Regional Landscape.

The New Jersey Wildlife Action Plan (Plan) is a proactive plan to conserve wildlife species before they become more rare and more costly to protect. The multi-scale plan identifies threats, conservation goals, and conservation actions at the state, landscape (5 regions; ocean is currently part of the Atlantic Coastal Regional Landscape), and sub-regional levels (identified as conservation zones within New Jersey's Plan). New Jersey submitted its Plan to the U.S. Fish and Wildlife Service on October 1, 2005, submitted its revised plan on July 26, 2006, and received final approval from the Service in September 2006.

The New Jersey Wildlife Action Plan is a living document and will undergo periodic revisions per comments and recommendations received by the public, through the regional stakeholder meetings, and as part of the adaptive management strategy outlined within the Plan. Digital copies of the Plan are available at the Division of Fish and Wildlife's Web site: www.state.nj.us/dep/fgw/ensp/waphome.htm

Summary of Delaware Bay Implementation Meeting

The objectives of the Delaware Bay Implementation Meeting were to convene regional leaders and stakeholders to:

- Provide stakeholders with a review the Delaware Bay Regional Landscape conservation goals and actions;
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions; and
- Seek stakeholder input on and identify fifty-five (55) specific and broad-based* priority conservation actions for the Delaware Bay Regional Landscape.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

The Delaware Bay Regional Landscape section of the New Jersey Wildlife Action Plan includes 8 goals, which focus on issues such as habitat conservation and protection, the conservation of populations of species of greatest conservation need, water quality, and public education and viewing opportunities. Each of the goals has a varying number of conservation actions associated with them. In total, the Delaware Bay portion of the Plan identifies 104 specific and broad-based* conservation actions.

- Provide local leaders and stakeholders with background on the objectives of the Wildlife Action Plan and its implementation;
- Provide a foundation for potential partnerships to implement the Wildlife Action Plan; and
- Seek stakeholder input to determine priority conservation actions for the Delaware Bay Regional Landscape.

In preparation for the working meeting, the Division of Fish and Wildlife (DFW) staff reviewed the 104 conservation actions associated with the Delaware Bay Regional Landscape and selected thirty-nine (39) actions considered priorities. The invited stakeholders were asked to review *in advance* the goals and actions associated with the Delaware Bay Region, as well as those actions pre-selected by DFW. The majority of the day was devoted to further discussion and final prioritization of the conservation actions.

Introductory Sessions

Jane Galetto, President of Citizens United to Protect the Maurice River and its Tributaries and chair of the Endangered and Nongame Species Advisory Committee gave welcoming remarks. She stressed the importance of partnerships in meeting the conservation goals of the New Jersey Wildlife Action Plan.

Dave Jenkins, Chief of ENSP, welcomed stakeholders and provided attendees with background on the purpose of the New Jersey Wildlife Action Plan and its basis in the Landscape Project. Jenkins stated that the plan is designed to be a blueprint for wildlife conservation for the full array of traditional and non- traditional conservation partners in the state, not solely the Division of Fish and Wildlife. His presentation focused on the conservation potential in New Jersey and he discussed the role and importance of partnerships in achieving conservation objectives in New Jersey.

Jessica Wilkinson, a senior policy analyst with the Environmental Law Institute, served as the facilitator, and gave an overview of the meeting objectives and agenda.

Kathy Clark, Principal Zoologist with the Endangered and Nongame Species Program, gave a presentation on threats to the habitat and wildlife of the Delaware Bay Regional Landscape.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal or action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

Larry Niles, a biologist with the Conserve Wildlife Foundation of New Jersey, gave a presentation on Delaware Bay migratory shorebirds.

Steve Eisenhauer, Regional Director of Stewardship for the natural Lands Trust, discussed the importance of old growth swamp forests to the region.

Kris Schantz, a Senior Zoologist with ENSP and coordinator of the New Jersey Wildlife Action Plan, gave a summary of the priority actions selected by DFW in advance of the meeting. She stated that for the Delaware Bay Region, the plan includes 8 broad-based* conservation goals and 104 specific and broad-based* conservation actions associated with those goals. In addition, Ms. Schantz informed participants that the actions not selected as priority will remain in the Plan as an integral part of the Plan's success to achieve the desired objectives, but that the priority list helps provide guidance to our stakeholders when allocating limited resources for future conservation projects. Ms. Schantz also informed participants that granting organizations such as the Geraldine Dodge Foundation and the Doris Duke Charitable Foundation will be more likely to fund projects that are addressed in the states' Wildlife Action Plans.

Facilitated Discussion

The majority of the remainder of the day was devoted to a discussion of the conservation actions associated with each of the region's conservation goals. Wilkinson led the participants through a discussion of each of the goals in turn. She asked participants to offer their comments on which of the conservation actions they considered to be of particular importance and which they felt were of lesser importance. In addition, participants were able to seek clarification on any of the actions that were unclear and add back in for further consideration actions not identified by DFW as priorities.

After a thorough discussion of the actions associated with each goal, the participants were asked to select a predetermined number of conservation actions they considered the highest priority for implementation within that goal. The number of actions participants were asked to select for each goal are found in Chart 1 below. In addition, ENSP staff assured the stakeholders that the potential edits to the actions discussed at the meeting would be reviewed and incorporated where feasible. The results of the participants' selection and the original and revised actions can be found in Attachment D.

**For the purpose of the prioritization exercise, conservation goals and conservation actions that were similar between conservation zones (sub-regional levels) were consolidated into one conservation goal <u>or</u> action. Such an action selected as a priority during the meeting would then affect all similar or related actions within the relevant conservation zones, making all of them priority actions.*

	Number of conservation actions per goal
Goal 1	18
Goal 2	2
Goal 3	4
Goal 4	11
Goal 5	9
Goal 6	N/A – 1 by default
Goal 7	6
Goal 8	4

Chart 1: Number of conservation actions participants were asked to select for each of the conservation goals.

Concluding Remarks

Dave Jenkins gave closing remarks and thanked the participants for their time and contributions.

ATTACHMENTS:

A: Priority State-level Conservation Goals and Strategies (Actions)

B: List of Delaware Bay Regional Landscape Invitees and Attendees

C: Delaware Bay Wildlife Action Plan Stakeholder Meeting Final Agenda

D: Delaware Bay Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Attachment A: Priority State-level Conservation Goals and Strategies (Actions)

New Jersey Wildlife Action Plan
Priority State-level Goals and Strategies

Below you will find thirteen priority state-level goals identified at the First Wildlife Action Plan Stakeholder Meeting held on February 23, 2006, and the associated priority conservation strategies identified at the Second Wildlife Action Plan Stakeholder Meeting held on April 6, 2006. The goals have been categorized by the main topic and, where appropriate, the sub-topic as identified within the New Jersey Wildlife Action Plan. The goals and associated priorities have been arranged in categories and key words and concepts appear in bold to provide focus for the array of New Jersey partners in conservation, land managers and stewards, outreach initiatives, and residents interested in managing their lands to support native wildlife.

All of the goals and strategies have integrated public education and outreach and are to be implemented with an active adapted management strategy. The New Jersey Division of Fish and Wildlife hopes to receive continual feedback on implementation successes and failures that our state can integrate into the Wildlife Action Plan and implementation process.

Addressing National, Interstate, and Statewide Threats

Suburban sprawl and large-acre zoning

Goal: Identify and **protect** breeding, migration, and wintering **habitats** and landscapes essential for long-term viability of wildlife and fish populations of species of conservation concern.

1. NJ Division of Fish and Wildlife (DFW) will collaborate with municipal and county planners to identify critical wildlife habitats for sensitive species and natural systems within their borders.
2. Increase the number of data sources to populate the Biotics database and work to improve data quality and decrease the time necessary to review and input the data.
3. Use geographic information systems (GIS) to create map products that guide land management, habitat conservation, restoration, land acquisition, and land planning at all levels of government and non-government organizations.
4. Mitigate impacts of existing development, particularly when adjacent to open space, through non-regulatory measures, (e.g., create and restore habitat on private lands through landowner incentive programs, backyard habitat initiatives, keeping cats indoors).
5. Increase the effective size and connectivity of public lands through the Landowner Incentive Program and targeted land acquisition.
6. Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available.
7. DEP will encourage New Jersey counties and/or municipalities to develop Regional Habitat Conservation Plans within the next 5 years as part of their smart growth plan by collaborating in the development of planning documents and zoning ordinances that consider the larger landscape region. Various methods to achieve this include

clustering development and in-fill development to maximize infrastructure, avoiding large-acre zoning, and minimizing fragmentation of habitat.

8. Work with Division of Land Use Regulation to strengthen and enforce existing regulations to prevent illegal stream cleaning or snag removal activities.
9. Require that all lands purchased with Green Acres funds develop management plans consistent with the NJ Wildlife Action Plan.

Goal: Maintain **connectivity of habitats** at the landscape scale.

1. Develop smart-growth plans at the municipal and county level whereby development is clustered and in-fill development maximizes infrastructure efficiency and cost savings while minimizing loss of habitat with priority on counties not already included in other regional planning areas such as the Pinelands or Highlands. Create incentives to encourage inter-municipal planning.
2. DEP will create a staff internally to provide technical support to New Jersey counties and/or municipalities to develop wildlife conservation planning integrated with watershed planning and land use regulations, within the next 10 years, to benefit wildlife, habitat, and the quality of life for New Jersey citizens. Prioritize in areas outside of regional planning areas of the Highlands and Pinelands.
3. Counties and municipalities should collaborate in developing master planning documents and ordinances that implement Habitat Conservation Plans.
4. Identify and prioritize, for Green Acres, the habitat corridors for acquisition or other preservation to decrease isolation of public natural lands.

Invasive Terrestrial and Aquatic Species and Exotic Pathogens

Goal: Identify, restore, and protect **unique ecosystem processes** including the control and/or removal of non-native invasive species, fire management, and delayed and alternate patch mowing.

1. Reduce regulatory impediments to restoration and enhancement activities.
2. Develop management techniques that can safely be used to mimic the historic role of fire in shaping ecosystems.
3. Increase the area of habitat enhanced by controlled burning techniques that mimic natural wildfires and support legislation to facilitate increased prescribed burning where appropriate.
4. Using a regional approach, identify and prioritize areas where ecosystem processes are threatened by invasive plants, organisms, and diseases; prioritize the threats relative to the vulnerability of affected wildlife and plant communities.
5. Reduce the area of phragmites and maintain native vegetation by restoring natural tidal flow in coastal wetlands.
6. Develop techniques to mimic or replace natural coastal sediment transport processes and integrate into implementation of beach replenishment and other shore protection projects.

7. Increase area and seral-stage range of successional habitats on managed lands where appropriate as indicated by GIS analysis.
8. Develop species- and habitat- specific "Best Management Practices" (BMPs) for management of various communities dependent upon disturbance.
9. Develop and recommend BMPs for use of biological control agents to reduce non-native or overabundant pests.

Goal: Reduce the adverse impacts of **non-native invasive species, subsidized predators, and over-abundant native species** on critical wildlife, natural communities, and habitat quality.

1. Create aggressive outreach programs for targeted groups (e.g., landscape designers, waterwatch groups, nurseries, etc) that reduce or eliminate the introduction and spread of invasive plants and animals.
2. Develop species- and habitat- specific "Best Management Practices" (BMPs) for controlling the most common and detrimental invasive species and incorporate that guidance into BMPs developed for other activities such as forestry, wildlife management, stream stabilization, dune stabilization, etc.
3. Educate the public about the negative impacts of free-roaming cats ("owned" and feral) on New Jersey's native wildlife and encourage responsible cat ownership and care through public service announcements, brochures, public presentations, etc.
4. Collaborate with animal rights/welfare groups, local municipalities and conservation organizations to develop and implement model ordinances, policies, and guidance documents to address the impacts of predators, including feral and free roaming cats, on native wildlife species, including:.
    a. A model ordinance for municipalities that elect to implement or allow trap, neuter, and release (TNR) programs to attempt to reduce feral cat populations.
    b. A guidance document/protocol for minimizing the impacts TNR on native wildlife.
    c. A model ordinance for regulating feeding of wildlife.
    d. A model pet licensing ordinance.
    e. Mapping of colonies to evaluate impact on species of conservation concern.
5. Identify areas where predation is significantly diminishing reproductive success of wildlife species of conservation concern and apply appropriate integrated predation management techniques.
6. Create and implement a system for reporting and qualifying new locations of priority invasive species.
7. Develop and support research to provide better information on the impacts of feral and free-roaming cats on native wildlife populations.
8. Create implementation plan for Invasive Species Task Force recommendations when completed.

Unsustainable Land Management Practices on both Private and Conserved Lands and Water

Goal: Encourage farmers, foresters, and land stewards of private, local, state, and federal lands to develop **habitat management plans** that enhance habitats for species of conservation concern and maintain or improve the ecological integrity of the natural community.

1. Increase staff in the NJ Habitat Incentive Team (NJ HIT) to educate and provide technical assistance for landowners enrolling in Landowner Incentive Programs.
2. Increase number of landowners through NJ HIT that conduct delayed mowing of hayfields and fallow fields until after most ground nesting birds have fledged at least one brood; leave a minimum of 20% of grass fields standing during winter for cover; and/or plant and maintain native warm season grasses.
3. Develop best-management practices (BMPs) or management prescriptions for species of conservation concern to reduce negative impacts of various land management practices such as forestry, agriculture, dune stabilization, stream stabilization, aquaculture, DOT mowing, etc.
4. Through surveys, increase the number of Category 1 streams justified by endangered and threatened species data.
5. Dedicate staff in DFW to provide technical assistance to develop site-based management plans with forestry or wildlife production goals using GIS and principles of landscape ecology as the foundation.

Direct Human Impacts on Native Wildlife and Ecosystem Health

Goal: Identify, protect, and **minimize human disturbance** at sensitive locations (nests, hibernacula, breeding pools, critical concentration or feeding areas, etc.).

1. Create funding that will allow a minimum of one conservation officer for each landscape region dedicated to increase protection of sensitive habitats at risk from frequent human disturbance, collection/poaching, and at protective barriers such as gates restricting entry to bat hibernacula.
2. Design and implement protective measures to minimize deleterious impacts of direct human disturbance at osprey and colonial waterbird nest sites, shorebirds along Delaware Bay, rare reptile and amphibian denning, nesting/breeding, and gestation sites, as well as bat hibernacula.
3. Review all stream encroachment and other permit applications within the Division of Fish and Wildlife and apply restrictions on acoustic intrusions and other activities with deleterious effects on aquatic wildlife.
4. Investigate impacts of controlled water releases on aquatic organisms (e.g., freshwater mussels) through current and future research.

Development and Long-term Monitoring

Goal: Conduct **long-term monitoring** to evaluate **population viability** through statewide surveys and atlases to determine the **effectiveness of protection and restoration** efforts of both wildlife and their habitats.

1. Maintain monitoring programs that collect data on species, suites of species, and habitats statewide, including but not limited to the following:
   - o Breeding Bird Atlas
   - o Breeding Bird Survey
   - o Delaware Bay Migratory Shorebird Survey
   - o Bald Eagle Midwinter Survey
   - o Herptile Atlas
   - o Calling Amphibian Monitoring Program
   - o Fish Monitoring-Streams and Ponds
   - o Freshwater Mussel Atlas
   - o Mid-Winter Waterfowl Survey
   - o Atlantic Flyway Breeding Waterfowl Survey
   - o DFW Bobwhite Call-Count Survey
   - o Woodcock Call-Count Survey
   - o DFW Beaver-Otter Survey
   - o Migratory Game Bird Banding Programs
   - o Colonial Waterbird Survey
   - o Beach Nesting Bird Survey
   - o Site-specific Fish Monitoring Programs
2. Complete the Coordinated Bird Monitoring Plan to increase the efficiency and effectiveness of regional and national bird surveys.
3. Develop GIS measures to evaluate the effectiveness of habitat conservation programs including acquisition, restoration, and connectivity.
4. Measure the enrollment acreage and effectiveness of backyard habitat management.
5. Through GIS, track the acreage and management of land enrolled in habitat enhancement programs administered by NJ HIT; monitor each site and evaluate the effectiveness of the management technique.
6. Where appropriate, install and monitor fish ladders to assist passage of anadromous fish in areas with dams; prioritize by waterways with fish species of conservation concern.

High Deer Densities

Goal: Identify, maintain, and restore natural vegetative communities through sustainable, **area-specific deer densities**.

1. Conduct forest health surveys and use forest health indices as a main factor in developing deer management goals with priority areas being contiguous forest blocks on public and private lands within Skylands, Delaware Bay, Piedmont Plains, and Pinelands Landscape Regions.
2. Amend regulation or legislation to implement programs that support increased hunter access and hunting opportunities like reduction of safety zone for bow hunting,

Sunday bow hunting, and providing economic incentives for hunters to spend more time in the field.

3. Institute measures to require addressing deer management for any property that receives state or federal funding. The land or agricultural management plans must include harvest quotas and mechanisms to insure implementation.
4. Fully fund the Hunters Helping the Hungry venison donation program, which allows hunters to donate venison to food kitchens. Many hunters are reluctant to harvest deer that would be wasted because they have no need of or an outlet for the venison. Full funding of this program will expand the program and help provide an incentive for hunters to continue harvesting deer and therefore help meet harvest quotas.
5. Expand the DFW community-based deer management program to work with private landowners and public land stewards to achieve deer densities compatible with the NJ Wildlife Action Plan's habitat management goals.
6. Develop and implement, through regulation or legislation, programs that require anyone receiving preferential tax treatment based on land-management practices to achieve deer management goals, including harvest quotas, to qualify for farm tax assessment or farmland preservation programs.

Contaminants

Goal: Restore and maintain wildlife and fish populations and critical habitats by eliminating or reducing **exposure to point and nonpoint source contamination**.

1. Reduce contaminants of concern (e.g., PCBs, DDT, mercury, petroleum products) to "No Adverse Effects" levels in areas where they are currently significantly affecting wildlife populations, such as the lower Delaware River, NY-NJ Harbor, and portions of the Atlantic coast.
2. Analyze tissues of raptors and waterbirds on a regular basis using 1) failed eggs, 2) nestling blood, 3) adults found dead, and 4) living adults, where appropriate, to assess contaminant levels and determine causes of mortality and nest failures. Analyze tissues of actual or typical prey items in nest areas to assess the level of contaminants and determine the threat within the food web; repeated measures may be used to indicate trend of contaminants in local prey.
3. Following the Meadowlands model, where contaminants are impacting wildlife populations and/or restoration efforts, develop a working group of experts to, 1) identify data gaps, 2) design study methodologies to measure existing ecosystem effects on wildlife (food chain studies), and 3) evaluate post restoration/clean-up effects on wildlife populations.

Motorized Recreation Vehicles

Goal: Identify and actively **protect public natural lands and water** with wildlife species of conservation concern **from off-road vehicle and personal watercraft use**.

1. Identify areas where off-road vehicle (ORV) or personal watercraft (PWC) use occurs in critical wildlife habitats and direct law enforcement to concentrate on those areas to enforce seasonal restrictions and posted/restricted areas. Obtain additional funding for additional officers to assist with enforcement.

2. Investigate the impacts that personal watercraft and off-road vehicles have on those species whose breeding, roosting, haul-out, and migratory stopover areas' requirements make them vulnerable to injury, mortality, or disturbance. Use Natural Resource Damage Assessment (NRDA) and economic methods to quantify benefits and losses relative to these resources and ORV/PWC damages.
3. Identify appropriate areas for establishing off-road vehicle use in accordance with local and/or regional Habitat Conservation Plans to minimize impact to important wildlife habitat. Concurrently, increase the legal and financial penalties for illegal off-road vehicle use.
4. Enact legislation to require registration of all all-terrain vehicles (ATVs) at time of purchase and annually thereafter.
5. Collaborate with off-road organizations and state and non-government agencies to address the problem of unlawful use of public and private natural lands by off-road vehicles. Develop and disseminate educational materials to all riders via registration, public areas and public service announcements, and investigate mentoring programs by off-road organizations.

Endangered, Threatened and Rare Wildlife

Goal: Restore populations of **endangered and threatened wildlife** to stable levels that allow their **delisting** through population management, protection of critical habitat, and habitat restoration and enhancement.

1. Develop recovery plans for species of greatest priority that are based on reliable assessment and monitoring of population levels and the identification of limiting factors. Species recovery plans should establish clear and specific strategies for reducing threats and improving habitat conditions and lead to recovery and maintenance of populations at viable levels that complement complete, viable, functioning ecosystems.
2. Reevaluate the status of listed and non-listed nongame wildlife every five years using the Delphi review process.
3. Conduct surveys to identify migratory corridors for bats, marine mammals, anadromous fish, Lepidoptera, and Odonata.

Migratory Stopover and Important Bird Areas Planning

Goal: Identify, monitor, and **conserve key migratory corridors and stopover locations** for migratory birds.

1. Conduct surveys of migrating passerines and raptors at major stopover areas, primarily the Cape May Peninsula, every five years.
2. Annually monitor shorebird populations along the Delaware Bayshore stopover.
3. Prioritize land acquisition, conservation easements, private landowner incentive programs, and mitigation funding, and develop management plans to conserve stopover habitat.

4. Identify a network of locations that will help sustain migratory bird populations by producing a set of recommendations for the conservation of Important Bird Areas (IBA) statewide.
5. Conduct studies and create models to identify migratory bird routes and assess the potential risks to avifauna from wind turbines, tall buildings, radio towers, and other "human-made" tall structures.
6. Conduct baseline surveys of other stopover areas such as Sandy Hook, Island Beach, and inland habitats important to migrating birds.

Review of Wildlife Action Plan

Goal: Ensure that **conservation activities** of federal, state, county, municipal, and private (non-government organizations and utility companies) lands affecting species of conservation concern are **consistent** with the NJ Wildlife Action Plan (Plan).

1. The most current version of the Plan will be continually available for review on the Division of Fish and Wildlife's Web site with an open invitation to submit comments.
2. Every five years, the Division of Fish and Wildlife's Endangered and Nongame Species Program will initiate review of the Plan beginning with Division and Department biologists in a process that includes DEP staff, the Endangered and Nongame Species Advisory Committee (ENSAC), and a wildlife summit in which adaptive management will be built into the revision.
3. DFW will work with federal, state, county, municipal, and private (NGOs) land managers to incorporate the goals and strategies of the Plan into current management plans by the first formal review in 2011.
4. Dedicate one meeting per year to reviewing the progress and soliciting input on the Plan, participants to include representatives of the ENSAC, the Fish and Game Council, and the Marine Fisheries Council.

Attachment B: List of Skylands Regional Landscape Invitees and Attendees

ATTACHMENT B

Delaware Bay Regional Landscape Stakeholder Meeting: Wildlife Action Plan

List of Attendees

First name	Last name	Organization	Invited	Attended
Russ	Allen	NJDEP-Division of Fish and Wildlife, Marine Fisheries	X	X
Steve	Atzert	USFWS-Forsythe NWR	X	
Lisa	Barno	NJDEP-Division of Fish and Wildlife, FWF, Chief	X	
Matt	Blake	American Littoral Society	X	X
Peter	Bosak	Cape May County Dept of Mosquito Control	X	
Grace	Bottitta	Ducks Unlimited, Inc./GLARO/Mid-Atlantic Field Office	X	
Mark	Botton	Fordham University	X	
Jeanette	Bowers-Altman	NJDEP-Division of Fish and Wildlife, ENSP	X	
Andrew	Bowman	Doris Duke Charitable Foundation	X	
Dianne	Brake	The Regional Planning Partnership	X	
Beth	Brandreth	US Army Corps. of Engineers-PA District	X	
Robert	Brewer	Cumberland County Planning Dept.	X	
Barbara	Brummer	The Nature Conservancy-NJ Chapter	X	
Joanna	Burger	ENSP Advisory Committee	X	
Brent	Burke	The Nature Conservancy-NJ Chapter	X	X
Andrew	Burnett	NJDEP – Division of Fish and Wildlife, Bureau of Wildlife Management	X	
Patti	Burns	Association of NJ Environmental Commissions	X	
Jody	Carrara	Association of NJ Environmental Commissions	X	
Robert	Cartica	NJDEP-Division of Parks and Forestry, Natural Lands Management	X	
Ben	Casella	NJ Farm Bureau	X	X
Paul	Castelli	NJDEP-Division of Fish and Wildlife, BWM	X	
Michael	Catania	Conservation Resources, Inc.	X	
Dave	Chadwick	Association of Fish and Wildlife Agencies	X	
Dave	Chanda	NJDEP-Division of Fish and Wildlife, Director	X	
Beth	Ciuzio	NJ Audubon Society	X	X
Kathleen	Clark	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Betsy	Clarke	USDA – APHIS Wildlife Services	X	X
Karen	Cole	NJDEP- Div. Water Quality,Municipal Finance & Const. Element	X	
Robert	Connell, Jr.	NJDEP – Bureau of Marine Water Monitoring	X	

ATTACHMENT B (continued)

First name	Last name	Organization	Invited	Attended
Philip	Correll	National Park Service	X	
Amy	Cradic	NJDEP, Asst. Commissioner	X	
Camille	Crichton-Sumners	NJDOT – Division of Project Planning and Development	X	
Michael	Davenport	Conserve Wildlife Foundation of NJ	X	
Joe	DeMartino	Ducks Unlimited	X	
Emile	DeVito	The NJ Conservation Foundation-Bamboo Brook and ENSP Advisory Committee	X	
Amanda	Dey	NJDEP-Division of Fish and Wildlife, ENSP		X
Tim	Dillingham	American Littoral Society	X	
Mark	Dobelbower	NJDEP – Division of Fish and Wildlife, Bureau of Law Enforcement, Chief	X	
Burt	Doremus	Cohansey Area River Preservation	X	
Donna	Drewes	Municipal Land Use Center	X	
Tom	Drewes	Natural Resources Conservation Service	X	
Pete	Dunne	NJ Audubon Society – Cape May Bird Observatory	X	
Rick	Dutko	NJDEP-NJ Natural Heritage Program, Office of Nat. Lands Mgmt.	X	
Ruth	Ehinger	NJDEP-Coastal Management Program	X	
Steve	Eisenhauer	Natural Lands Trust/ Peek Preserve	X	X
Janet	Eisenhauer	South Jersey Land and Water Trust	X	
Susan	Elbin	Wildlife Trust	X	
Troy	Ettel	NJ Audubon Society	X	
Jose	Fernandez	NJDEP-Division of Parks and Forestry	X	
Leslie	Ficcaglia	Cumberland County Planning Board	X	
Lynn	Fleming	NJDEP-Division of Parks and Forestry	X	
John	Flynn	NJDEP-Green Acres	X	
Cristina	Frank	NJ Audubon Society	X	X
Jane	Galetto	ENSP Advisory Committee	X	X
Kathy	Giordano	NJDEP – Division of Water Quality, Municipal Finance/ Land Acquisition	X	
Tom	Gravel	The Trust for Public Lands	X	
Amy	Green	Amy S. Green Environmental Consultants	X	
William	Harrison	Office of Smart Growth	X	
Bruce	Hawkinson	NJ Department of Transportation	X	
Helen	Heinrich	NJ Farm Bureau	X	
Jean	Herb	NJDEP – Office of Policy, Planning, and Science	X	
Dan	Hernandez	Stockton State College	X	
Larry	Herrighty	NJDEP-Division of Fish and Wildlife, BWM, Chief	X	

First name	Last name	Organization	Invited	Attended
Rebecca	Hersh	NJ Future	X	
Peter	Himchak	NJDEP – Bureau of Marine Fisheries	X	
Damian	Holynskyj	NJDEP – Division of Fish and Wildlife, Environmental Review	X	
George	Howard	NJ State Federation of Sportsmen's Clubs	X	
Lisa	Jackson	NJDEP, Commissioner	X	
Dave	Jenkins	NJDEP-Division of Fish and Wildlife, ENSP, Acting Chief	X	X
Amanda	Johnson	National Marine Fisheries Service – Northeast Regional Office	X	
Elizabeth	Johnson	American Museum of Natural History	X	
Jim	Joseph	NJDEP – Bureau of Shellfisheries	X	
Teri	Jover	Pinelands Preservation Alliance	X	
Russell	Juelg	Pinelands Preservation Alliance	X	
Beth	Kabert	USDA – APHIS Wildlife Services	X	
Tom	Keck	NJDEP-Division of Parks and Forestry	X	
Craig	Kessler	Ducks Unlimited, Inc.	X	
Jung	Kim	Office of Smart Growth	X	
Michelle	Knapik	Geraldine R. Dodge Foundation	X	
Kim	Korth	NJDEP – Division of Fish and Wildlife, ENSP	X	X
Tony	Kramer	Natural Resources Conservation Service	X	
Jan	Larson	ENSP Advisory Committee	X	
Rick	Lathrop	Rutgers University-CRSSA Lab and ENSP Advisory Committee	X	
Jay	Laubengeyer	The Nature Conservancy-NJ Chapter	X	
Theresa	Lettman	Pinelands Preservation Alliance	X	
Chris	Linn	DE Valley Regional Planning Commission	X	
Julie	Lockwood	Rutgers University	X	
Lisa	Manning	National Marine Fisheries Service – Office of Protected Resources	X	
Robert	Marshall	NJ Department of Transportation, Division of Project Planning and Development	X	
Mark	Mauriello	NJDEP-Division of Land Use	X	
Martha	Maxwell-Doyle	Partnership for the Delaware Estuary	X	
Suzanne	McCarthy	DE Valley Regional Planning Commission	X	X
Tom	McCloy	NJDEP – Division of Fish and Wildlife	X	
Flo	McNelly	NJDEP – Division of Parks and Forestry	X	X
Bill	MacQueen	Cape May County Zoological Society, Inc.	X	X
Nancy	Merritt	Salem County Watershed Task Force	X	

ATTACHMENT B (continued)

First name	Last name	Organization	Invited	Attended
Erica	Miller	Tri-State Bird Rescue	X	
Nick	Miller	Wildlife Conservation Society	X	
David	Mizrahi	NJ Audubon Society	X	X
Krista	Nelson	Partnership for the Delaware Estuary	X	
Ted	Nichols	NJDEP – Division of Fish and Wildlife, Bureau of Wildlife Management	X	
Tom	Niederer	NJ Forestry Association	X	
Larry	Niles	Conserve Wildlife Foundation of NJ	X	X
Cindy	O'Connor	The Wetlands Institute	X	
Margaret	O'Gorman	Conserve Wildlife Foundation of NJ, Executive Director	X	
Tony	Petrongolo	NJDEP-Division of Fish and Wildlife, Bureau of Land Management, Chief	X	X
Laurie	Pettigrew	NJDEP-Division of Fish and Wildlife, Bureau of Land Management	X	X
Lisa	Plevin	US Senator Frank Lautenberg's Office	X	
Fran	Rapa	NJ Conservation Foundation	X	X
Brad	Rosenthal	Woodbine Public Works – Mayor's Office	X	
Dale	Rosselet	NJ Audubon Society – Cape May Bird Observatory	X	
Ron	Ruckenstein	Salem County Planning Dept.	X	
Renee	Scagnelli	Citizens United	X	
Kris	Schantz	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Annette	Scherer	USFWS – NJ Field Office	X	X
Howard	Schlegel	USFWS – Cape May & Supawna Refuges	X	X
Eric	Shrading	USFWS-NJ Field Office	X	
Dale	Schweitzer	ENSP Advisory Committee	X	
Jim	Sciascia	NJDEP-Division of Fish and Wildlife, I & E, Chief	X	
Bill	Shadel	American Littoral Society	X	
Mark	Shaffer	Doris Duke Charitable Foundation	X	
Chris	Smith	Natural Resources Conservation Service	X	
James	Smith	Cape May County Planning Dept.	X	
Richard	Smith	Ducks Unlimited, Inc.	X	
Larissa	Smith	Conserve Wildlife Foundation of NJ	X	X
Randall	Solomon	New Jersey Sustainable State Institute	X	
Ben	Spinelli	Office of Smart Growth	X	
Kimberly	Springer	NJDEP – Coastal Management Program	X	
John	Staples	USFWS-NJ Field Office	X	
Eric	Stiles	NJ Audubon Society	X	

ATTACHMENT B (continued)

First name	Last name	Organization	Invited	Attended
Ken	Strait	PSE & G	X	
Chris	Sturm	NJ Future	X	
Terry	Terry	NJDEP-Division of Fish and Wildlife, ENSP	X	
Alicia	Tillet	Cumberland County Planning Dept.	X	
Larry	Torok	NJDEP-Division of Land Use	X	X
Maya	VanRossum	Delaware Riverkeeper	X	
Kathleen	Walz	NJDEP-NJ Natural Heritage Program, Office of Nat. Lands Mgmt.	X	
Jay	Watson	NJDEP-Commissioner's Office, Deputy Commissioner	X	
Erika	Webb	Dept. of Community Affairs, Office of Smart Growth	X	
Michael	Weinstein	NJ Sea Grant	X	
Kelly	Westervelt	Partnership for the Delaware Estuary	X	
Alison	Whitlock	USFWS – Division of Federal Assistance	X	
Lee	Widjeskog	NJDEP – Division of Fish and Wildlife	X	
Diane	Wieland	Cape May County Tourism Dept.	X	
Donald	Wilkinson	NJDEP-Division of Fish and Wildlife	X	
Jessica	Wilkinson	Environmental Law Institute	X	X
Peter	Winkler	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Patrick	Woerner	NJDEP-Division of Fish and Wildlife, ENSP	X	X
Kim	Wood	Cumberland County	X	
Meghan	Wren	Bayshore Discovery Project	X	
Thomas	Wright	Regional Plan Association	X	
Neil	Yoskin	Bennett & Yoskin	X	
Cindy	Zipf	Clean Ocean Action	X	
Cindy	Zirkle	Cohansey Area River Preservation	X	

Attachment C: Delaware Bay Wildlife Action Plan Stakeholder Meeting Final Agenda

ATTACHMENT C

CONSERVE WILDLIFE
FOUNDATION OF NEW JERSEY

Wildlife Action Plan
Delaware Bay Regional Landscape Implementation Meeting
Wednesday, September 12, 2007
9:00 a.m. to 4:30 p.m.
NJ Audubon's Center for Education and Research in Goshen, Cape May County

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Meeting Objectives

- Review Delaware Bay Landscape goals and conservation actions
- Provide opportunity for stakeholders to discuss and seek clarification on priority conservation actions
- Seek stakeholder input on selection of priority conservation actions

Meeting Agenda

8:30 a.m. Continental Breakfast

9:00 a.m. Welcome and Opening Remarks
- Jane Galetto, Citizens United to Protect the Maurice River and its Tributaries

9:10 a.m. Introduction to the New Jersey State Wildlife Action Plan (WAP)
- Dave Jenkins, Acting Chief, Endangered and Nongame Species Program Division of Fish and Wildlife, Department of Environmental Protection
- Questions and Answers (5 minutes)

9:40 a.m. Overview and Introductions
- Jessica Wilkinson, Environmental Law Institute

9:50 a.m. Threats to the Habitat and Wildlife of the Delaware Bay Regional Landscape
- Kathy Clark, Principal Zoologist, Endangered and Nongame Species Program Division of Fish and Wildlife, Department of Environmental Protection

10:05 a.m. Presentation– Larry Niles. Delaware Bay migratory shorebirds
- Questions and Answers (5 minutes)

10:30 a.m. Break

10:45 a.m. Presentation– Steve Eisenhauer, Natural Lands Trust: Old growth swamp forests

- Questions and Answers (5 minutes)

11:05 a.m. Summary of WAP Prioritization Process

- Kris Schantz, Senior Zoologist, Endangered and Nongame Species Program Division of Fish and Wildlife, Department of Environmental Protection

11:20 a.m. Facilitated Discussion of Priority Actions (continued)

12:30 – 1:30 p.m. Lunch

1:30 p.m. Facilitated Discussion of Priority Actions (continued)

ATTACHMENT C (continued)

3:15 p.m. Break

4:00 p.m. Wrap-Up & Next Steps

- Dave Jenkins, Acting Chief, Endangered and Nongame Species Program

4:30 p.m. Meeting Adjourns

Attachment D: Wildlife Action Plan Priority Conservation Actions & Action-related Comments per the Stakeholders' Meeting

Goals (1-8)	Conservation Actions' Numbers		DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
1	**Identify, restore, enhance and/or protect important habitats to maintain viable populations of endangered, threatened, and species of conservation concern.**				
	1a	**Forests, woodlands**			
		1a-1	Use GIS, other remote sensing tools, and surveys to identify**critical habitats** supporting local bald eagle nesting, summering and wintering populations and assess their condition. Take action to minimize habitat loss and maintain contiguous habitats by restoring, enhancing, and/or protecting woodland and riverine habitats and waterways on public and private lands through direct purchase or easements. Enlist private lands in preservation programs that will maintai forest free of human disturbance during key periods.		There was some concern over the accuracy and precision of mapping. However, mapping will only be as accurate or precise as the available GIS data layers permit. Therefore, no revisions were made to this action, but it is noted that NJ should continue to improve/ refine available GIS-based information and maintain equipment of "up-to-date" remote sensing tools.
		1a-2	Use GIS, other remote sensing tools, and surveys to identify**critical core forests** and assess their condition for forest-nesting birds and bald eagles, and maintain information. Identify protection strategies (e.g., landowner incentives and acquisition) to maintain large core areas in perpetuity. Identify adjacent habitats that can be managed to enhance the total size of forest habitat.		
		1a-3	Maintain and manage forest patches adjacent to marshes and grasslands for bald eagle and raptor suitability. Maintain and enhance floodplain forests for forest passerines and raptors. Set and implement guidelines for human disturbance on critical lands and allow forests and forest patches to mature to old growth to maximize suitability.		
		1a-4	Increase the effective size and connectivity of forests on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures and surveys to identify important corridors that connect large, contiguous tracts of forest and target these areas for acquisition to maintain a system of large, connected tracts of forest within and between conservation zones. Where appropriate, enhance and restore forested habitat through reforestation, revegetation, forest improvement cuts, and other forest management prescriptions.		

Goals (1-8)	Conservation Actions' Numbers		DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
		1a-5	Increase the area of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, pine snakes, corn snakes, black-throated green warbler, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey (in prep). • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). (Excluding Cape May Peninsula) • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create optimal habitat for barred owl and red-shouldered hawk. (Excluding Cape May Peninsula) • All areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature to create optima habitat for barred owl and red-shouldered hawk. (Cape May Peninsula ONLY)	***PRIORITY***	
			• These forest types to also include but are not limited to: an uneven-age structure; mature forests and near-mature forest with >80% canopy closure, 65-80% canopy closure and structural diversity; limited areas of pine-oak with < 25% canopy closure; scrub-oak communities; and regenerating stands of forests (e.g., Atlantic white cedar). (Excluding Cape May Peninsula) • These forest types to include but are not limited to: an uneven-age structure; mature forests with 65-95% canopy closure and structural diversity; scrub-oak communities and regenerating stands of forests (e.g., Atlantic white cedar). (Cape May Peninsula ONLY) • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans.		
		1a-6	Develop, implement, and evaluate best management practices (BMPs) and guidelines to maintain, enhance, and/or restore resident and migratory bald eagle, osprey, and forest-interior passerine and raptor habitat on public and private lands. //Following portion found within Cape May Peninsula only: Develop an action plan for immediate implementation should habitat levels fall below the minimum necessary to sustain the migration. Actively manage stat and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands.	***PRIORITY***	
		1a-7	Collaborate with Division of Parks and Forests to enhance Belleplain State Forest for wildlife species of conservation concern: uneven-age stand management, preserve standing and fallen dead biomass, manage harvest practices in wetland forests and adjacent upland forest to promote older-growth.		

Goals (1-8)	Conservation Actions' Numbers		DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	1b	Grasslands, early-successional fields, and scrub-shrub habitats			
		1b-1	Use GIS, other remote sensing tools, and surveys to identify **critical grassland habitats** and assess their condition for nesting birds, maintain information, and incorporate all new survey and mapping data into the Landscape Project and Biotics database. Identify protection strategies (e.g., landowner incentives, farmland preservation, and acquisition) to maintain large core areas of grassland in perpetuity. Identify proximate habitats that can be managed to enhance the total size of suitable grassland habitat, with the goal of managing grassland/early succession areas totaling 2,000-3,000 ha (7.7–11.5 square miles). **(Cohansey only)**	***PRIORITY***	
		1b-2	Use GIS measures, other remote sensing tools, and surveys to identify **critical scrub-shrub** (areas with >25% woody vegetation <20 feet in height) and open field habitats, assess their condition for local populations of frosted elfins (e.g., on powerlines), nesting birds (e.g., yellow-breasted chat, blue-winged warbler, brown thrasher), marsh-edge birds (e.g., sedge wrens) and other wildlife, maintain information, and incorporate all new survey and mapping data into the Landscape Project and Biotics database. Identify protection (e.g., landowner incentives, farmland preservation, and acquisition) and management strategies (e.g., timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) to maintain, enhance, and/or create them.	***PRIORITY***	Revised to include marsh edge birds: "...nesting birds (e.g., yellow-breasted chat, blue-winged warbler, brown thrasher), marsh-edge birds (e.g., sedge wrens) and other wildlife, maintain…"
		1b-3	Increase the effective size and connectivity of grasslands on permanently protected public lands and surrounding private lands through incentive programs and targeted land acquisition. Use GIS measures and surveys to identify important corridors that connect large, contiguous tracts of grasslands and target these areas for acquisition to maintain a system of large, connected tracts of grasslands within and between conservation zones. Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies. Work with the NJ DEP, Green Acres Program and the Dept. of Agriculture to identify parcels for acquisition or purchase of development rights. Acquire habitat through direct purchase or easements and enlist private lands in preservation and management programs that offer long-term stability of a matrix of grassland schemes. Target 2,000 hectare (7.7 sq. mi.) regions. **(Cohansey only)**		Stakeholders asked if this action supports converting forest to grassland. No, it does not. As such, it has been revised for clarification to include the following: "...Where possible, enhance and restore grassland habitat through revegetation and management practices such as prescribed burns and appropriate mowing strategies, brush-hogging, and other appropriate methods with little or no impact to forested and wetland dependent species of greatest conservation need. Work with the NJ...."
		1b-4	Develop, implement, and evaluate best management practices (BMPs) for **rights-of-way that benefit species with small area requirements** (e.g., frosted elfin, moths, and early-successional birds). BMPs should focus on maintaining existing early succession habitats and work to establish new grassland and scrub-shrub habitats along utility line rights-of-way, at field/forest edges, and adjacent to fire breaks where appropriate for small-area species.		
		1b-5	Develop, implement, and evaluate best management practices to protect, maintain, and/or **enhance habitats (other than rights-of-way)** for resident and migratory grassland bird and scrub-shrub bird communities on public and private lands and that support populations of bronze copper, frosted elfin, Hessel's hairstreak, and scrub-shrub birds, particularly at locations where early-successional habitats are maintained for (other) primary purposes. Actively manage state and other conservation lands to enhance autumn food availability, and promote backyard habitat management to make similar improvements on private lands.		

Goals (1-8)	Conservation Actions' Numbers		DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
		1b-6	Promote landowner incentives and manager cooperation to protect and enhance local populations of frosted elfins (e.g., on powerlines), and scrub-shrub/open field birds (e.g., on airports).		
	1c	Aquatic, wetland, riparian, floodplain, and marsh habitats			
		1c-1	Use GIS, other remote sensing tools, and surveys to identify **critical aquatic and wetland habitats** and assess their condition for migratory and wintering waterfowl populations of conservation concern, snow geese concentration areas, and finfish and shellfish populations. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through protection strategies (e.g., acquisition, landowner incentives) and to maintain/enhance existing waterfowl habitat where such management complements rare species management. // Maintain and enhance upland and floodplain forests on private and public lands for forest birds by promoting contiguous forests and discouraging fragmentation.	***PRIORITY***	
		1c-2	**Locate potential vernal pools** through aerial imagery and surveys and **integrate certified vernal pool data** into the DEP regulations database and Landscape Project.	***PRIORITY***	Stakeholders agreed that this action was missing a key element, the actual species' surveys and/or certification of the vernal pools based on the species present. This action has been revised as follows throughout all regions: "Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pool data into the NJ DEP regulations database and Landscape Project."
		1c-3	**Identify and protect habitat for fish** by plotting distributions of special concern fish species, and integrate those data into the Biotics database.	***PRIORITY***	
		1c-4	Work with the NJ Division of Fish and Wildlife Bureau of Law Enforcement, the Division of Parks and Forestry's State Park Rangers, and the USFWS officers to enforce regulations governing recreational activities (including the use of personal watercraft) in refuges and other sensitive habitats, and discourage activities that cause harm or disturbance to vegetation, wetlands and wildlife.	***PRIORITY***	Revisions to this action include changing "Parks and Forestry's State Park Rangers" to "Parks and Forestry's State Park Police." For clarification, we revised "…recreational activities (including the use of personal watercraft) in refuges…" to "…recreational activities (including but not limited to the use of personal watercraft, all terrain vehicles, etc.) in refuges…"
		1c-5	Develop, implement, and evaluate best management practices to enhance and/or restore aquatic (open waters, streams, and freshwater wetlands) and adjacent riparian habitats supporting populations of special concern and rare fish such as by removing obstructions to fish passage in rivers and streams. Restore and protect NJ's critical non-trout streams through the use of protection strategies (e.g., acquisition of adjacent riparian habitats, working with municipality planning boards to require ecologically-sound buffers, easements).	***PRIORITY***	There were concerns that this action is dedicated to fish while other species may benefit. Given we do not have rare mussels in this region and this action was purposely created to target fish, it remains as is.
		1c-6	Develop, implement, and evaluate best management practices and guidelines to maintain, enhance, and/or restore tidal marsh habitats on public and private lands to support foraging bald eagles, as well as osprey, peregrine falcon, northern harrier and black rail on the bayshore, especially with regard to disturbance, mosquito control and vegetation management in marshes.	***PRIORITY***	Revised to include "shorebirds" among the list of species that can benefit from restored tidal marsh habitats.

Goals (1-8)	Conservation Actions' Numbers		DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
		1c-7	Work with NJDEP-OCE, USACE, and other appropriate agencies to develop, implement, and evaluate best management practices for using dredged material to improve habitat for wildlife, particularly for spawning horseshoe crabs and migrating shorebirds.	***PRIORITY***	
		1c-8	Identify and protect critical areas of submerged aquatic vegetation to benefit waterfowl, finfish, and shellfish species through surveys, GIS measures and other remote sensing tools, expert opinion, and historical records. Restablish/restore historically important submerged aquatic vegetation beds in Delaware Bay tributaries to benefit waterfowl and waterbirds.	***PRIORITY***	
		1c-9	Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl.		There was some concern at the meeting that impoundments have not been addressed elsewhere and this action seemed an appropriate place to integrate that information. As such, this action has been revised to: "Investigate and improve current marsh management techniques to benefit critical wildlife species, in particular high marsh nesting birds and waterfowl, and include in marsh BMPs and species dependent on mudflats and impoundments."
		1c-10	Identify areas that may benefit from marine conservation zone status to protect sensitive habitats and species from human disturbance. Develop and implement protection measures in marine and riverine habitats. /// Develop and evaluate the creation of a marine conservation area to minimize human disturbances and concomitant damage to habitat in areas of breeding and foraging marsh wildlife.		
		1c-11	Develop, implement, and evaluate habitat management that will promote foraging and roosting of black skimmer and least tern.		
		1c-12	Develop, implement, and evaluate best management practices to enhance and/or restore riparian habitats to maintain th migration of raptor and passerine populations at viable levels. Actively manage state and other conservation lands to enhance autumn food availability and contiguous wetlands and wetland networks for forest birds and Lepidopteran species, and discourage the loss of wetland habitats through filling, nutrient loading, or contamination.	***PRIORITY***	There was confusion about what riparian habitats this action targeted. As such, "freshwater" has been added to the statement where appropriate throughout this region's portion of the Wildlife Action Plan (Plan).
		1c-13	Use GIS measures and surveys to identify and assess**core forested wetland and riparian/floodplain habitat** for forest-dependent breeding species: forest raptors (red-shouldered hawk, long-eared owl, and barred owl) and forest-interior songbirds. Take action to minimize habitat loss by restoring, enhancing and/or protecting habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans.		
		1c-14	**Identify threats to vernal pools** through systematic monitoring and devise strategies to protect vernal pool dependent species.		

Goals (1-8)	Conservation Actions' Numbers		DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	1d	**Beach and dune habitat**			
		1d-1	Use GIS, other remote sensing tools, and surveys to identify **critical beach habitats** and assess their condition **for migratory shorebirds** and maintain appropriate information in the Landscape Project and Biotics database. Identify protection strategies and best management practices to maintain suitable habitat for migratory shorebirds in perpetuity.	***PRIORITY***	Revised to clarify this action is targeting "...critical Delaware Bay beach habitats..."
		1d-2	Develop, implement, and evaluate best management practices to minimize beach loss and preserve optimal shoreline habitats for horseshoe crabs and migratory shorebirds.	***PRIORITY***	
		1d-3	Investigate the potential for management and creation of migratory shorebird feeding and roosting areas on Cape May peninsula, particularly at Cox Hall Creek, Fishing Creek, and Cape May NWR.	***PRIORITY***	One stakeholder requested that actions 1d-2 and 1d-3 be combined. However, given both actions were identified as priorities and given stakeholders' limited resources, these actions remain separate so that stakeholders can which action(s) they are able to conduct/ implement.
	Broad-based habitat actions (include various habitat types)				
	1e		Use GIS, other remote sensing tools, and surveys to identify **critical habitats (upland and wetland)** for bald eagles (resident and migratory), and **critical stopover habitats** for migratory birds, bats, and Lepidopteran species, assess their condition, and maintain information. Identify habitat requirements and monitor trends in habitat change to develop protection strategies and best management practices (e.g., regulations, land acquisition, incentive programs) to maintain the migration at viable levels for species populations.	***PRIORITY***	
	1f		Use GIS, other remote sensing tools, and surveys to identify and map **significant natural vegetative communities that may host wildlife species of conservation need**, particularly on public lands and lands that serve as wildlife corridors.		
	1g		Protect habitats through innovative public and private partnerships. Promote existing landowner incentives for protecting and managing wildlife habitat and develop landowner cooperative agreements to protect significant populations of bald eagles, grassland and scrub-shrub birds, forest-interior wildlife, migratory shorebirds, songbirds, and raptors, freshwater wetland birds, vernal pools, and rare amphibian and invertebrates.		
	1h		Develop, implement, and evaluate best management practices for **forest, shrub, and field habitats along the upland edge of the shoreline and marshes** for raptor and passerine suitability, especially to maintain feeding and roosting habitat for autumn-migrating birds.		This action has been revised for clarification, targeting landbirds. The revision includes changing "…autumn-migrating birds" to "...autumn-migrating landbirds."
	1i		Revise existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species habitat requirements become available. Develop, review, and improve species-habitat associations as new land use/land cover data become available.	***PRIORITY***	
	1J		Reclaim degraded rare species habitats by working with land management agencies to determine the appropriate actions needed to restore habitat value for the documented species. Appropriate actions might include the control of harmful, invasive, vegetation, restoring natural stream flows, revegetation with native plants or restoring habitat structure.	***PRIORITY***	Revisions to the action included targeting the areas for mitigation. The action was revised throughout the Plan to: "Identify, prioritize, and reclaim degraded rare species…"

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
2	**Protect water quality and the availability of wetland habitats.**			
	2a	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian, and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion.	***PRIORITY***	
	2b	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. Seek appropriate classifications for stream segments based on Index of Biotic Integrity (IBI) results that do not fulfill Category One requirements.	***PRIORITY***	
	2c	Maintain water chemistry/ water quality important for aquatic-dependent or semi-dependent species native to the Pinelands. For example, maintain low pH waters important for breeding populations of Pine Barrens treefrogs and carpenter frogs.		
	2d- ADDED	Investigate impacts of aquaculture on water quality. Determine relative effects of locations and aquaculture techniques. Develop and implement management actions to minimize impacts.		Action was added to the Delaware Bay Region's Bayshore Conservation Zone. It was added after the stakeholders' meeting and therefore, was not part of the prioritization exercise.
3	**Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.**			
	3a	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, other remote sensing tools, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas in need of control projects according to the level of impact on the ecosystem.	***PRIORITY***	
	3b	Work with appropriate government agenciesto survey for and monitor the spread of invasive insect species that jeopardize forest health. The species of primary concern include the southern pine beetle, orange-striped oakworm, gypsy moth, and oak lace bug. Take appropriate control methods to reduce tree damage and limit the spread of infestations, provided such methods avoid excessiv direct or indirect harm to non-target species.	***PRIORITY***	
	3c	Work with public and private landowners and managers and regulatory agencies to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive, non-indigenous plants in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by such plants. // Use appropriate measures to control the spread of phragmites (common reed) and restore the marshes to native species.	***PRIORITY***	

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	3d	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective.		
	3e	Where appropriate, continue to develop and expand incentives for harvesting antlerless deer.		
	3f	Develop, implement, and evaluate management strategies to reduce the impacts of mute swan herbivory on native vegetation in impoundments and marshes supporting species of conservation concern. // Monitor and evaluate the impacts of snow goose herbivory to the salt marshes and the native wildlife that rely upon this habitat. Develop, implement, and evaluate management strategies to minimize any unreasonable negative impacts on native wildlife, focusing on areas supporting species of conservation concern. // Monitor and evaluate the impacts of vegetative damage to the wild rice marshes by resident Canada geese. Develop, implement, and evaluate management strategies to maintain and enhance the wild rice marshes by minimizing goose damage and controlling resident Canada goose populations.	***PRIORITY***	
	3g	Assess the impact of laughing gull population on habitat used by migratory shorebirds to assess the need fo**integrated wildlife damage management of gulls** is necessary.	***PRIORITY***	
4	**Prevent, stabilize and/or reverse declines of endangered, threatened, and special concern species.**			
	4a	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and where appropriate, the Division of Parks and Forestry Bureau of Law Enforcement of critical sites (nesting, basking, gestation, dens, spawning and nursery sites) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (northern pine snakes) and human disturbance (off-road vehicles) and harassment; update map as additional data become available.	***PRIORITY***	A stakeholder requested that managers be informed as well as law enforcement so that they can also protect critical sites. Due to the sensitive nature of these sites, we have incorporated managers as follows: "…Division of Parks and Forestry Bureau of Law Enforcement, and managers, as appropriate, of critical sites..."
	4b	Recruit and educate local law enforcement of endangered species laws by developing and hosting a training seminar. Develop a partnership between local law enforcement, USFWS Special Agents, and the NJ Division of Fish and Wildlife's Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (northern pine snakes, corn snakes, timber rattlesnakes), and human disturbance (off-road vehicles).		USFWS representatives explained that "Special Agents" would only be involved in investigations. As such, throughout the Plan, where this action is found, we have determined and revised the text to address the appropriate agencies and/or law enforcement(e.g., National Wildlife Refuge officers, National Park Service Rangers, US Army and Navy Natural Resource Managers).

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	4c	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity, delineating and posting nests and significant roosting areas, building cooperation with private landowners, and working closely with law enforcement and volunteers to minimize disturbance at nest sites. Continue to monitor reproductive success of eagles.		
	4d	Reduce the impacts of human disturbance on red knots and other migratory shorebirds that use the intertidal zone of beaches and inlets by posting and/or fencing critical migratory sites, and developing management plans or policies that minimize human impacts // Notify wildlife law enforcement agents (and when applicable, conservation organizations and local municipalities) of critical staging areas; identify and enforce the necessary restrictions to human activities.// Control and reduce disturbance to red knots and migratory shorebirds by closing posted areas during peak migration periods and increasing the regular presence of state conservatio officers at beach nesting bird sites during the nesting season.	***PRIORITY***	
	4e	Conduct surveys determine locations of, and identify habitat management requirements for, secretive marsh nesting birds.	***PRIORITY***	
	4f	Research the impact of land use patterns on Pine Barrens treefrog, northern pine snake, and corn snake populations.		
	4g	Investigate impacts of aquaculture on migratory shorebirds, waterfowl, finfish, shellfish, and other wildlife species of conservation concern. Determine relative effects of locations and aquaculture techniques. Develop and implement management actions to minimize impacts.	***PRIORITY***	
	4h	Research the intensity and characteristics of threats to wildlife species of conservation concern and their habitats, including causes and effects of habitat loss, degradation, and alteration, edge, disturbance, impacts of roads, predation, competition by invasive plants and animals, disease, contaminants, food availability, hybridization, and how water quality degradation and contaminants affect rare species.	***PRIORITY***	
	4i	Develop and implement proactive habitat conservation goals that will meet and maintain the recovery needs of all endangered and threatened wildlife and fish populations, shorebirds, coastal marsh birds, migratory songbirds and raptors, bald eagles, osprey, colonial waterbirds, freshwater wetland birds, and waterfowl (consistent with the North American Waterbird Conservation Plan), northern harrier and other high-marsh species, and plans for amphibian and reptile populations (consistent with NE Amphibian and Reptile Conservation).	***PRIORITY***	
	4J	Prevent chemical contamination, siltation, eutrophication, and other forms of pollution/contamination to wetlands used by wildlife especially as breeding sites that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality.	***PRIORITY***	
	4k	Work with public and private landowners and managers with significant grassland bird and scrub-shrub/open field bird populations, bald eagle, cavity-nester, freshwater wetland bird, and raptor populations to enhance targeted wildlife habitat through the implementation of best management practices and incentive programs.		

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	4L	Develop a fish Index of Biotic Integrity (IBI) to better assess the presence and distribution of fish species within the area's streams.	***PRIORITY***	
	4M	Research the habitat requirements for resident and migratory grassland birds, forest passerines, and woodland raptors, corn snakes, northern pine snakes, Cope's gray treefrog, Pine Barrens treefrog, and Indiana bats, when appropriate. Recommend appropriate management and regulations based on the results. Experimentally implement silviculture techniques as needed to develop guidance for enhancing forests for forest-dependent species. Develop guidance on prescribed burning and other management techniques for grassland species. // Research the population size, recruitment, habitat requirements, and threats to the northern diamondback terrapin population; and population distribution to determine critical areas for protection.	***PRIORITY***	
	4N	Assess changes in availability of low and high marsh, directly, and by using indicator species (black rail, northern harrier), and relate habitat changes to marsh management practices. Evaluate management practices and revise as appropriate to benefit species c conservation concern.	***PRIORITY***	
	4o	Enhance northern diamondback terrapin populations by: a) determine the sustainable population goal, b) enforcing compliance with current crab trap regulations (e.g. turtle excluder devices), c) evaluating if current regulations are sufficient, in conjunction with naturally occurring survivorship rates, to protect and reduce mortality of northern diamondback terrapin populations, and d) closing the harvest season until sustainable population levels are reached.		
	4p	Collaborate with DOTs, NGOs, and volunteers to identify key road-crossing areas of northern diamondback terrapin and work with appropriate government agencies to install turtle crossing signs and erect turtle barriers or provide safe passage, as appropriate, depending on the habitat and location.	***Potential DFW PRIORITY***	
	4Q	Develop strategies to maximize food availability and beach suitability for migratory shorebirds by working with regulatory agencies to restore horseshoe crabs populations to 1990 level, minimize beach loss/development, and investigate beach enhancement.	***PRIORITY***	Stakeholders commented that this action, as is, implies the horseshoe crab population decline is due to beach management, when it should emphasize overharvesting. As such, this action has been revised to: "Develop strategies to restore horseshoe crab populations to 1990 level, using methods including (but not limited to) harvest restrictions, minimizing beach loss and development, and beach enhancement."
	4r	Develop, implement, and evaluate BMPs for shoreline management to maintain and enhance horseshoe crab spawning habitat.		
	4s	Evaluate the impacts of roads on endangered and threatened species and other nongame wildlife. Research, develop, and implemen methods to reduce roadside mortality of wildlife (e.g., implementing wildlife underpasses, road closures).		

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	4t	Protect wildlife species of conservation need, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all critical wildlife habitats, public and private conservation lands.	***PRIORITY***	Stakeholders commented that we should not focus solely on destruction of "critical habitat" but rather any habitat where these wildlife species occur. The action was revised to: "Protect wildlife species of conservation concern, especially slow moving terrestrial-bound species (e.g. reptiles, amphibians) and sensitive forest nesters (e.g. red-shouldered hawks, barred owls) by prohibiting off-road vehicles from all public and private conservation lands except where authorized by the governing agency by working with law enforcement agencies and implementing other means as they are developed.
	4u	Work with state and non-government agencies to evaluate the impacts of enduro events on listed species and species of special concern. If such events are to be permitted in the future, work with the Divisions of Parks & Forestry and Fish & Wildlife to designate riding areas develop/implement BMPs.		
5	**Inventory, determine distribution, and monitor all endangered, threatened, special concern wildlife and fish species.**			
	5a	Use the Biotics database and Landscape Project to identify where species location data and monitoring gaps exist. Design and implement coordinated presence/absence surveys and monitoring to acquire data in those areas.	***PRIORITY***	
	5b	Conduct surveys in appropriate habitats and work with partners in conservation to determine species **distributions and identify critical habitats** and protection needs for dragonflies and damselflies, timber rattlesnakes, corn snakes, northern pine snakes, Pine Barrens treefrog, frosted elfin, bronze copper, and Hessel's hairstreaks. // Encourage landowners to report timber rattlesnake sightings for inclusion in the distribution mapping and potential inclusion in telemetry study. Monitor habitat use and survival of encountered animals using radio-telemetry to locate dens and identify critical habitats.		
	5c	Survey suitable habitats for wildlife species of greatest conservation need to determine distribution **establish baseline information, and monitor trends** for wildlife species of greatest conservation need: grassland birds every four years, with more frequent surveys in actively managed grasslands, bald eagle nesting and production annually, ospreys every three years, woodland raptors' distribution every four years, shoreline surveys annually, northern harrier and black rail surveys every two to four years, American woodcock every five years, Cope's gray treefrog and eastern tiger salamander annually, and migratory raptors and passerines every five years. Develop marsh surveys for migratory shorebirds. Identify and record important migratory shorebird foraging and roosting areas. Develop baseline surveys for listed and SC rail species, and migratory songbird use.	***PRIORITY***	

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	5d	Conduct concentrated field sampling for listed or special concern fish species (e.g., Atlantic and shortnose sturgeon, margined madtom) in areas indicated by Fish Track Database queries and incorporate data into the Biotics database.	***PRIORITY***	
	5e	Conduct breeding waterfowl surveys annually to monitor population trends.		
	5f	Develop and conduct nighttime surveys to inventory nightjars (whip-poor-wills, chuck-will's-widows, common nighthawks), northern saw-whet owls, and eastern screech-owls.		
	5g	Conduct surveys to identify migratory pathways of bats in the shoreline conservation zone through telemetry or Radio Detection And Ranging (RADAR). Data to be used in evaluation of potential impacts of wind turbines or other coastal structures on migratory bat populations.	***PRIORITY***	
	5h	Conduct state-wide sampling (e.g., mist netting) to**determine distribution, range, and habitat use of summer bats**. Long-term sampling of forest dwelling bat species should be conducted to determine population trends and species response to changes in habitats. If Indiana bats are found, conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies.		The phrase "state-wide" has been removed from this action throughout the Plan.
	5i	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys.		
	5J	Conduct surveys in suitable, previously un-surveyed areas to determine if listed or special concern freshwater mussel species are present. Repeat surveys every four years to monitor populations. Incorporate freshwater mussel survey results into the Biotics database and determine critical areas for listed species.	***PRIORITY***	
	5k	Assess population levels of listed and special concern rails, and determine whether directed management efforts are needed to reach or maintain viable population levels.	***PRIORITY***	
	5L	Monitor horseshoe crab population and egg densities relative to migratory shorebird needs, and recommend management to increase horseshoe crab populations in the short term (e.g., harvest restrictions) and long term (e.g., habitat enhancement and harvest moratorium). // Monitor red knot movements to identify all habitats used in relation to food (horseshoe crab egg) densities. Identify habitat standards to maintain optimal migratory shorebird populations and implement within land acquisition and management plans.	***PRIORITY***	
	5M	Investigate the habitat suitability and techniques for restoring bobcats to the Maurice River Watershed conservation zone. Conduct presence/absence surveys for bobcat using scent-post surveys within suitable habitat.		

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	5N	Investigate carrying capacity of area marshes for wintering American black ducks to help inform management actions and priorities.		Stakeholders requested clarification of the objective of this action at the meeting and within the Plan. The action has been revised to: "Determine carrying capacity of area marshes for wintering American black ducks to inform decisions in setting Atlantic Flyway population objectives and to guide management actions."
	5o	Identify and research water quality parameters for bald eagle, osprey, spotted turtle, special concern amphibians including vernal pool obligate and facultative species, and rare dragonfly and damselfly populations. // Investigate the effects of mosquito control on amphibian, dragonfly, and damselfly populations.	***PRIORITY***	Revised to clarify that [part of] this action is targeting the effects of "chemical mosquito control"on amphibians.
	5p	Investigate habitat parameters of rare fish (e.g., margined madtom) and recommend management and protection guidelines.	***PRIORITY***	
	5Q	Use GIS measures, other remote sensing tools, and surveys to identify important staging areas for red knots and other migratory shorebirds and determine and enforce the necessary restrictions on human activities to minimize disturbance at and destruction of these sites. Obtain necessary approvals from New Jersey Tidelands Council for management actions.		
6	**Assess large-scale habitat change (every five to 10 years).**			
	6a	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.	***PRIORITY***	
7	**Promote public education, awareness, wildlife conservation, and participation in habitat restoration efforts on private land.**			
	7a	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners.		
	7b	Develop, maintain, and enhance opportunities for eco-tourism in a manner consistent with wildlife and habitat enhancement including but not limited to the creations of interpretive trails, the creation of viewing areas, and wildlife-related recreational opportunities that do not negatively impact species of conservation concern and their habitats.	***PRIORITY***	
	7c	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame fish species.		
	7d	Educate the public about the importance of the habitats [within the appropriate zones] to the Atlantic coast bird, bat, and Lepidopteran species' migration through newsletters, press releases, brochures, presentations, and web pages.		
	7e	Raise public awareness of the Tuckahoe, Maurice, and Cohansey River as a significant bald eagle and raptor wintering area through newletters, press releases, brochures, presentations, and web pages.	***PRIORITY***	

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	7f	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities.	***PRIORITY***	
	7g	Develop targeted outreach brochures for pet owners, outdoor-recreation enthusiasts, and local citizens adjacent to critical habitats about the importance of specific habitats to populations of migratory birds and the importance of maintaining disturbance-free areas for them.		
	7h	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research that examines the full range of impacts of feral cat colonies on local wildlife populations and of feral cat colony management (including TNR) on local wildlife populations and local feral cat populations.	***PRIORITY***	
	7i	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies.		
	7J	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program.	***PRIORITY***	
	7k	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control.	***PRIORITY***	
8	**Protect and enhance important and unique natural communities.**			
	8a	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats, including but not limited to all habitats in the southern 30K of the peninsula, the drainages of Fishing Creek, Dias Creek, Bidwell Creek, Dennis Creek and Cedar Swamp Creek, the Cohansey River, Stow Creek, Raccoon Ditch, and habitats in and adjacent to tidal wetlands. Recognize the particular importance of the autumn migratory corridor along the upland edge of bayshore marshes.	***PRIORITY***	There were questions regarding the "southern 30K" as the critical point for the migratory stopover, is it enough? Research conducted by the NJ DEP, Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP) has shown that this portion of the peninsula is the critical stopover habitat. The action remains as is in the appropriate zones with the inclusion of the "drainages of the Maurice River" added to the Maurice River conservation zone.

Goals (1-8)	Conservation Actions' Numbers	DELAWARE BAY Conservation Actions	Status per stakeholders' meeting	Edits made per comments and recommendations received at Stakeholders' meeting on September 12, 2007.
	8b	Incorporate sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping.		Stakeholders discussed the conflict between data entering or not entering the ENSP's Biotics database and/or Landscape Project map. Due to the lack of detail or missing information, IBA data is/was not sufficient for ENSP's database or Landscape Project map. For clarification, this action has been revised to: "Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards."
	8c	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) **unique habitats such as Pinelands-ecotype forest and streams** in the Manumuskin and Menantico tributaries, and older swamp forests of east and west Bear Swamps.		
	8d	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) the **marsh and wetland forests** of the Tuckahoe, and the marsh and upland edge of the Great Egg Harbor River system.		
	8e	Protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) Belleplain State Forest and Peaslee Wildlife Management Area **for forest (e.g., northern pine snake, red-headed woodpecker) and forest-interior (e.g., barred owl, red-shouldered hawk) wildlife**.	***PRIORITY***	This action was revised for clarification that enhancement of the forest means to enroll private surrounding lands in incentive programs, managing to increase effective forest size. The action was revised to: "Protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) lands surrounding Belleplain State Forest and Peaslee Wildlife Management Area for forest (e.g., northern pine snake, red-headed woodpecker) and forest-interior (e.g., barred owl, red-shouldered hawk) wildlife."
	8f	Develop and implement **long term protection for beaches on the lower bayshore**, including Villas, Kimble's and Reed's beaches, which are particularly important to migrating shorebirds in spring, as is the vast marsh matrix of Egg Island Wildlife Management Area between Fortescue and the Maurice River.	***PRIORITY***	
	8g	Develop and implement **long term protection for habitats along the major rivers** of the Cohansey, Back Creek, Nantuxent, and the Maurice, as centers of bald eagle nesting and wintering populations for southern NJ.	***PRIORITY***	One stakeholder requested a similar action that targets waterfowl concentrations, however action 1c-1 addresses this so no new action was created.