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

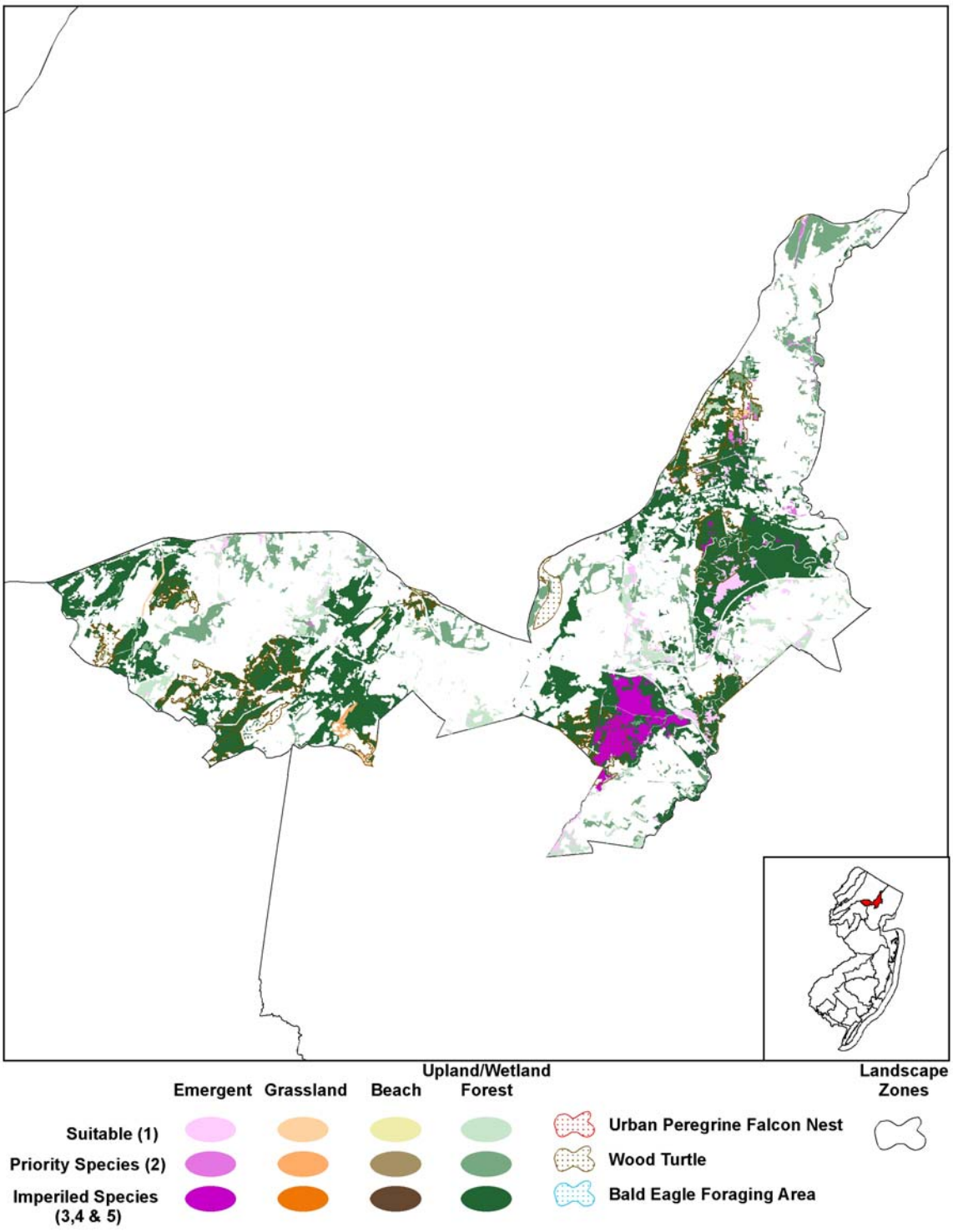
The Urban Highlands Zone is located in the central portion of Morris County and extends eastward along the Interstate 80 corridor to the county border, and then north along the Interstate 287 corridor into portions of Passaic and western Bergen counties (Figure 33). The zone is characterized by extensive 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.