4. Southern Piedmont Plains

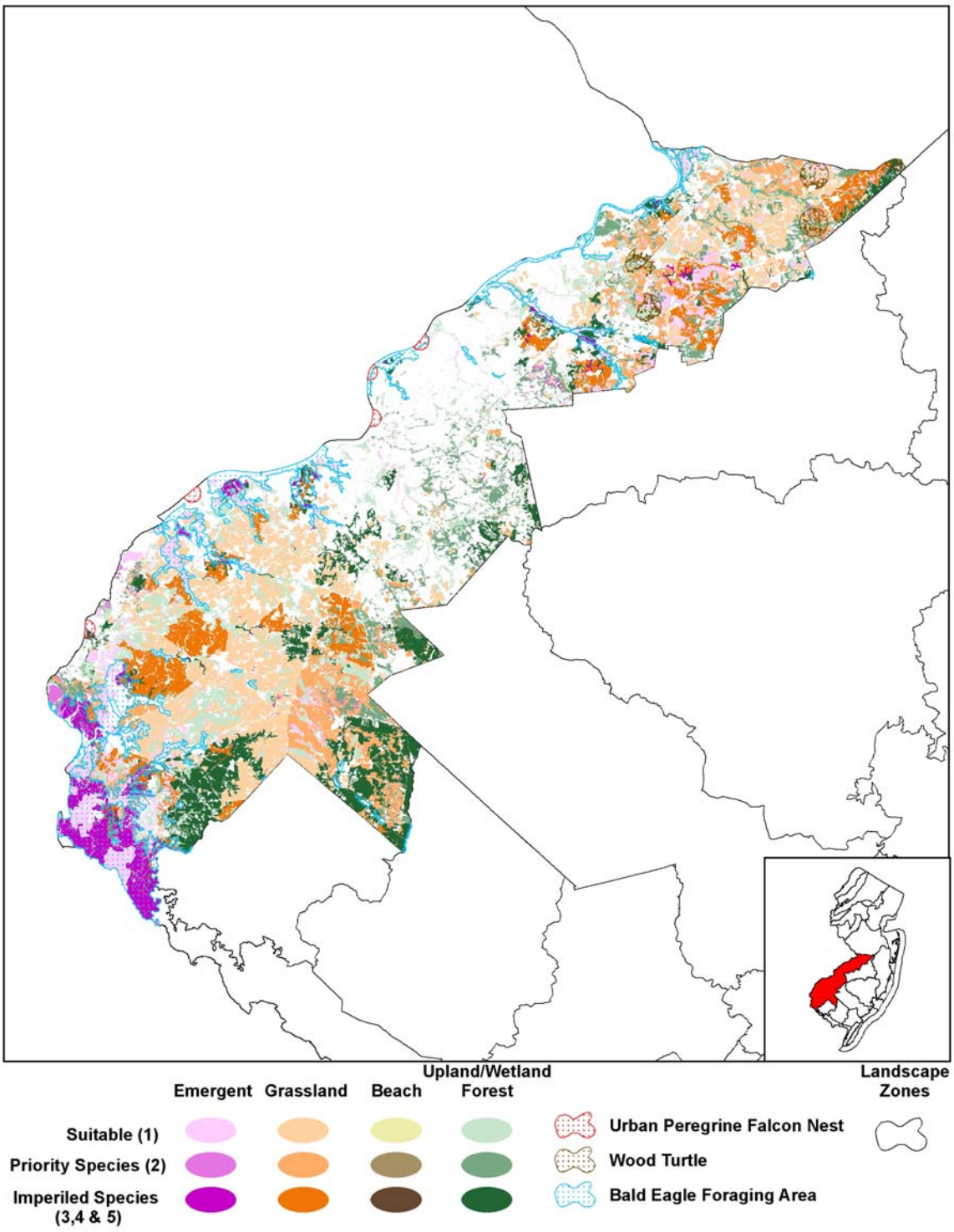
a. Habitats

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	
1º	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)*
1º	Develop and implement a habitat improvement and restoration program for coldwater fish. *(Protect habitat – fish)*
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	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.

<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 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.

<u>Conservation Organizations</u>

- 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.