F. Priority Conservation Zones, Assessments, and Strategies within the Piedmont Plains

1. Northern Piedmont Plains

a. Habitats

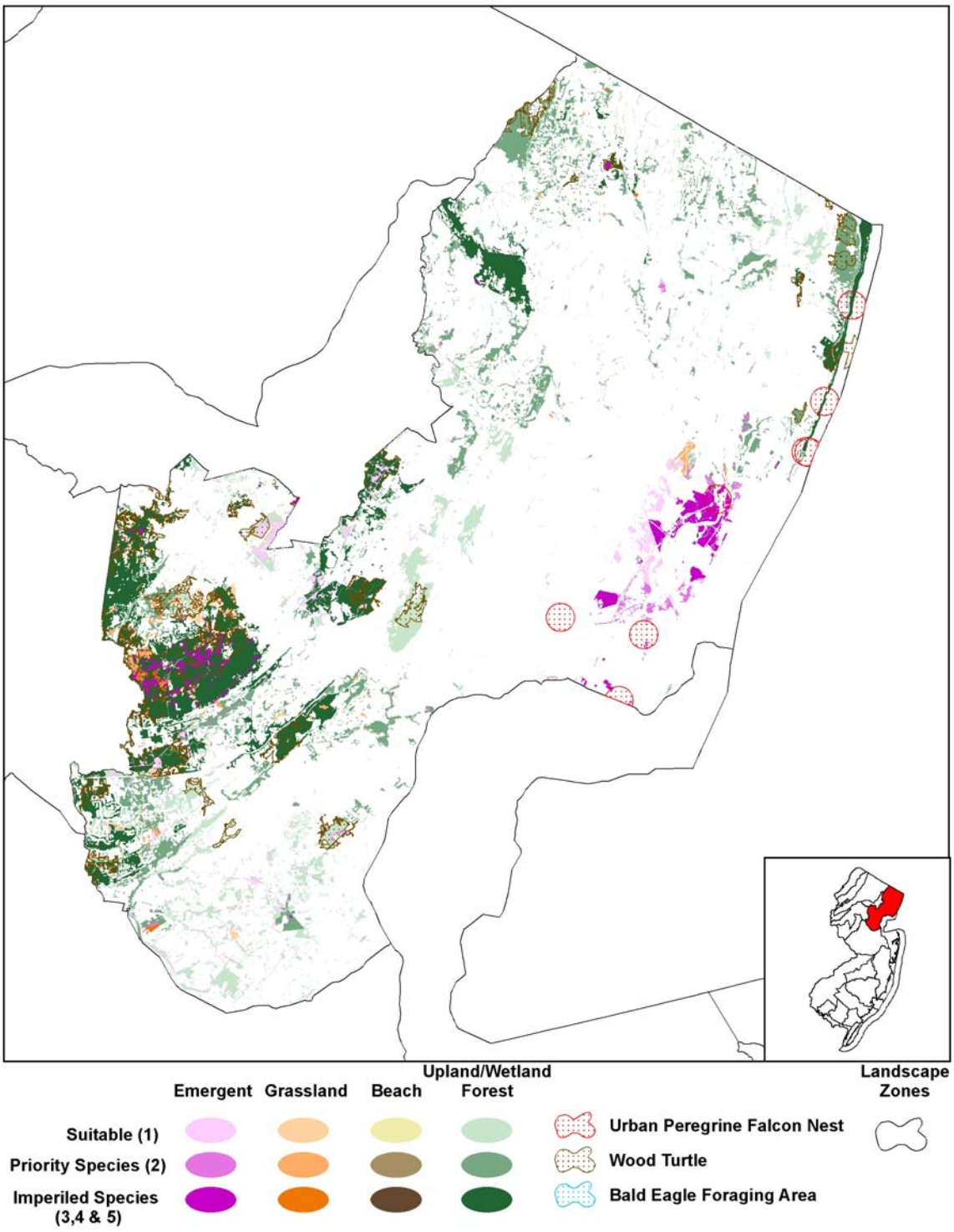
The Northern Piedmont Plains lies within parts of eight counties in northeastern New Jersey (Figure 18). This zone is extensively developed, and about 10 percent of this entire area is considered suitable for wildlife of conservation concern. The Palisades Interstate Park, Great Swamp National Wildlife Refuge, Hackensack Meadowlands, Preakness Mountain, and the network of riparian habitat and public land (mainly county land and watershed protection lands) provide habitat for the majority of endangered and threatened wildlife habitat in this zone.

Over 4,000 hectares or 15.4 square miles of emergent wetlands exist in the Northern Piedmont Plains, most of which occur in the Hackensack Meadowlands, Black Meadows, Great Swamp National Wildlife Refuge (NWR), and Saw Mill Creek Wildlife Management Area (WMA). Approximately 33,500 hectares or 129.3 square miles of forest (upland, wetland, riparian) also exist in the Northern Piedmont Plains. The largest patches (over 404 hectares, 998.3 acres) occur in a scattered network of public natural lands, including High Mountain, Washington Rock, Morristown National Park, and Palisades Interstate Park, with the largest patch (nearly 3,000 hectares, 11.6 square miles) in the Great Swamp NWR.

Early-succession and grassland habitat are scarce in this zone. Less than 1,500 hectares (5.8 square miles) of open fields, such as grasslands, pastures, or agricultural fields, most of which are in Harding Township in Morris County, provide habitat for a few endangered and threatened grassland species. Teterboro Airport, Piscataway Township in Middlesex County and the fields near the Great Swamp NWR contain the largest grassland patches in this zone. Utility rights-of-way provide some of the most critical scrub-shrub habitat for butterflies and species of conservation concern.

Unlike early-successional and grassland habitats, forests take many years to mature, develop a complex vegetative structure, and are difficult to retain in large, unbroken tracts. Therefore, forests (upland, wetland and riparian) are high-priority habitats in this zone. Forest areas should be maintained and allowed to increase in age and size if possible. Grassland and early succession habitats should be maintained where they exist and increased in size if possible. Grasslands in an agricultural matrix, forming a larger complex, can provide habitat for area-sensitive grassland species and a robust grassland wildlife community. However, grasslands and early-succession habitats should not be created at the expense of large or contiguous forests.

Figure 18. Critical landscape habitats within the Northern Piedmont Plains conservation zone, as identified through the Landscape Map (v2).



b. Wildlife of Greatest Conservation Need

The Northern Piedmont Plains supports one federal threatened, 14 state endangered, 12 state threatened, 71 special concern and regional priority species, and seven additional harvested species of regional priority. Species of special concern and regional priority include grassland dependent species, scrub-shrub birds, marsh birds, forest passerines, raptors, reptiles and amphibians, and invertebrates. In addition, summer populations of forest-dwelling bat species, potentially including the federal endangered Indiana bat, are known to occur in the Northern Piedmont.

Upland and wetland forest at the western extent (especially Great Swamp NWR) and the northeast corner (Palisades Interstate Park) of this zone are important for area-sensitive forest species including the barred owl, red-shouldered hawk, and forest-nesting songbirds, and provide suitable habitat for Indiana and other forest-dwelling bats. The Palisades Interstate Park supports peregrine falcons and the last known remaining population of Allegheny woodrat and the Great Swamp NWR provides habitat for an extraordinary array of bird and amphibian species. These regions are oases surrounded by extensive development and are susceptible to impacts associated with development.

At the eastern extent of this zone, large rivers and associated freshwater wetlands, especially the Meadowlands, provide extensive breeding and foraging habitat for variety of freshwater marsh-nesting birds and long-legged wading birds (waterbirds) including pied-billed grebes, American bitterns, sedge wrens, northern harriers, black- and yellow-crowned night-herons, and insects such as the ringed boghaunter. These large expanses of wetlands and open water are important as migratory stopover and wintering areas for landbirds, waterbirds and waterfowl. Peregrine falcons breed here in good numbers, mainly on bridge structures.

Extensive rivers and streams, and associated habitats (“riparian habitats”) throughout the Northern Piedmont Plains provide habitat for a variety of forest reptiles and amphibians including wood, box and spotted turtles, blue-spotted and northern spring salamanders, and provide foraging and breeding areas for colonial waterbirds (mainly herons and egrets). For these suites of species, American beaver activity can be detrimental because it makes some areas unsuitable by creating permanent standing water bodies.

Although not abundant in this zone, scattered grasslands in the Northern Piedmont Plains provide habitat for savannah, grasshopper, and vesper sparrows; northern bobwhite quail, bobolinks, northern harriers, two insect species, American burying beetles and Harris’ checkerspots; and provide basking and nesting sites for turtles.

Finally, while most of the Northern Piedmont Plains zone is highly developed, urban/suburban habitat supports a number of species for which historical habitats have been significantly altered or reduced. Peregrine falcons, cliff swallows, chimney swifts, and nighthawks breed in highly urbanized areas and utilize man-made structures for nesting habitat. Concentrations of summer bats, including Indiana bats, may utilize buildings and alternative man-made roosts in order to raise their young. The following tables identify the species of greatest conservation need within this zone.

Wildlife Species and Associated Habitats of the Northern Piedmont Plains

Table PP10. Federal Endangered and Threatened Species*

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Indiana bat				X**
Reptiles				
Bog turtle		X		X
Insects				
American burying beetle♦		X	X	

*All Federal Endangered and Threatened species have an Endangered status on the NJ List of Endangered Wildlife
**Potential presence.
♦Only historic records exist. Species believed to be extirpated.
X: Species occurs within the identified habitat.

Table PP11. State Endangered Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Allegheny woodrat				X
Bobcat				X
Birds				
American Bittern		X		
Bald Eagle		X		X
Black skimmer		X		
Least tern		R	R	
Loggerhead shrike (migrant)		X		
Northern goshawk			X	
Northern harrier				X
Peregrine falcon		X	X	
Pied-billed grebe		X		
Red-shouldered hawk	X	X		
Sedge wren				X
Amphibians				
Blue-spotted salamander		X		X

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

Table PP12. State Threatened Species

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
Barred Owl				X
Black-crowned night-heron		X		
Bobolink			X	
Cooper's hawk				X
Grasshopper Sparrow			X	
Long-eared owl			X	X
Osprey		X		
Red-headed woodpecker				X
Savannah sparrow			X	
Yellow-crowned night-heron		X		
Reptiles				
Wood Turtle				X
Amphibians				
Long-tailed salamander				X
Insects				
Checkered white		R	R	R

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

Table PP13. Nongame Species of Conservation Concern

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Mammals				
Eastern small-footed myotis				X**
Eastern red bat				X**
Hoary bat				X**
Marsh rice rat			X	
Silver-haired bat				X**
Southern bog lemming				X
Birds				
Acadian flycatcher				X
American golden-plover			X	
American kestrel			X	
Baltimore oriole				X
Black-and-white warbler				X
Black-billed cuckoo				X
Blackburnian warbler				X
Black-throated blue warbler				X
Black-throated green warbler				X
Blue-headed vireo				X
Blue-winged warbler		X		X
Broad-winged hawk				X
Brown thrasher				X
Canada warbler				X
Cerulean warbler				X
Chimney swift				X
Cliff swallow		X		
Common barn owl			X	
Common nighthawk			X	X
Eastern kingbird			X	
Eastern meadowlark			X	
Eastern screech-owl				X
Eastern towhee			X	X
Eastern wood-pewee				X
Field sparrow			X	X
Golden-winged warbler				X
Gray catbird				X
Gray-cheeked thrush				X
Great blue heron		X		X
Great crested flycatcher				X
Great egret		X		
Green heron		X		
Hooded warbler				X
Indigo bunting			X	X
Kentucky warbler				X
King rail		X		
Least bittern		X		
Least flycatcher				X
Little blue heron		X		
Louisiana waterthrush				X
Marsh wren		X		
Northern flicker				X
Northern parula				X
Pine warbler				X
Prairie warbler				X
Prothonotary warbler				X
Purple finch				X
Rose-breasted grosbeak				X
Saltmarsh sharp-tailed sparrow		X		
Scarlet tanager				X
Seaside sparrow		X		
Sharp-shinned hawk				X
Spotted sandpiper		X		
Summer tanager				X
Veery				X

Nongame Species of Conservation Concern (continued)

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds (continued)				
Willow flycatcher				X
Winter wren				X
Wood thrush				X
Worm-eating warbler				X
Yellow-billed cuckoo				X
Yellow-breasted chat				X
Yellow-throated vireo				X
Reptiles				
Eastern Box Turtle			X	X
Northern copperhead				X
Northern diamondback terrapin		X		
Spotted Turtle		X		X
Amphibians				
Fowler's Toad		X		X
Jefferson salamander				X
Northern spring salamander				X
Insects				
Harris's checkerspot, *Chlosyne harrisii*			X	
Ringed boghaunter, *Williamsonia lintneri*	X			X
Fish				
American brook lamprey*	X			

*Species is also recognized as target species of ecoregional concern by the Nature Conservancy - NJ Chapter
**Potential presence.
X: Species occurs within the identified habitat.

Table PP14. Game Species of Regional Priority

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

Common Name	Water	Wetlands	Grasslands	Forests and Forested Wetlands
Birds				
American black duck	X	X		X
American woodcock				X
Canada goose (Atlantic population)	X	X		
Clapper rail		X		
Northern bobwhite			X	
Virginia rail		X		
Wood duck				X
Fish				
Brook trout*	X			

*Species is a New Jersey game species, but is also an excellent indicator of water quality.
X: Species occurs within the identified habitat.

Table PP15. Fish Species

Common Name	Water
Fish	
Cutlips minnow	X
Slimy sculpin	X

X: Species occurs within the identified habitat.

Table PP16. Game Species
Note: Species identified within the table have seasonal harvests within New Jersey and currently are not identified as regional priority species, but they are considered by NJDFW to be species of concern.

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

X: Species occurs within the identified habitat.

c. Threats to the Wildlife and Habitats of the Northern Piedmont Plains

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

The Northern Piedmont Plains is highly developed with scattered tracts of forest and wetlands, most of which are preserved in public natural lands and non-government organization conservation (NGO) lands. Loss and fragmentation of habitats on privately-held lands and isolation of protected natural lands through continued development and roads are the most significant threats to wildlife in this zone. Roads and development destroy and degrade habitat and are barriers to wildlife movements. Fragmentation of habitat allows for many invasive plant species to become integrated into natural areas thereby degrading habitat suitability for many species. Also, fragmentation increases stress on remaining trees, thereby increasing susceptibility of invasive pests (such as Asian longhorned beetles and gypsy moths). White-tailed deer thrive in fragmented non-urban areas and the resulting over-browse of the forest system in this landscape is severe and virtually eliminates forest regeneration. White-tailed deer also selectively browse vegetation, giving invasive species that they avoid eating (barberry species, etc) a stronghold in our forested understory.

The sinuous network of riparian corridors in the center of this zone provides the only safe egress for wildlife to disperse through developed regions. Stream encroachment is the leading cause of degradation of riparian ecosystems including habitat loss, increased water temperatures and runoff of contaminants. Invasive plants, such as common reed or Phragmites (*Phragmites australis*), and purple loosetrife (*Lythrum salicaria*) severely reduce suitability of wetlands for marsh-nesting birds. Breeding populations of non-native trout (brown and rainbow) resulting from stocking for recreational use compete with native populations of brook trout. Mute swans reduce abundance of submerged aquatic vegetation in many reservoirs and freshwater wetlands in the region. Furthermore mallards, which thrive in areas with human habitation, compete with and displace American black ducks and have also been known to hybridize with them. In the Northern Piedmont Plains, these riparian areas include Saw Mill Creek WMA, Hackensack Meadowlands, northern D&R Canal State Park, and other areas in eastern Hudson and northern Middlesex counties. North American beavers can create wetland habitat suitable for many species by damming up streams, but may, in turn, alter riparian habitat downstream from the dam.

Many forest and grassland species are area sensitive and their populations decline as habitat size decreases. Mowing/brush-hogging of fields, roadsides and utility rights-of-way during breeding season (mid-April through early July) increases mortality and reduces productivity of many birds, reptiles and amphibians, invertebrates, and small mammals.

Regional threats to priority species in urbanized areas such as chimney swifts, common nighthawks, cliff swallows, and peregrine falcons include changes in modern building construction that prohibit nesting and increase wildlife strikes. Urbanized areas also typically experience increased pesticide use for mosquito control. Additionally, the impact of free-ranging domestic and feral cats on wildlife is well documented and can severely impact and destroy important urban wildlife populations. Also see Section I-E "Threats to Wildlife and Habitats" (page 17) of this document.

d. Conservation Goals

- Protect, enhance, and restore critical habitats as identified by the Landscape Project, focusing primarily on habitat for forest-interior passerines, raptors, forest-dwelling bats, and other forest-dwelling species and, secondarily, in areas where grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub (areas with >25% woody vegetation <20 feet in height) wildlife communities currently exist.
- Protect, maintain, and/or enhance critical aquatic habitats, freshwater and coastal wetlands, and water quality to preserve populations of rare wildlife such as wood turtles, long-tailed salamanders, rare damselflies and dragonflies, and state or federal listed, special concern and coldwater fish species that rely on high water quality.
- Identify, protect, maintain, enhance, and/or restore important grassland (areas with >75 % herbaceous and <25% woody vegetation) and scrub-shrub habitats (areas with >25% woody vegetation <20 feet in height) for grassland, open field, and scrub-shrub butterfly and bird populations.
- Inventory and monitor all endangered, threatened, and special concern wildlife and fish species in this conservation zone; especially those groups with data gaps.
- Prevent and reverse declines of the Allegheny woodrat, peregrine falcon, reptiles and amphibians, birds, butterfly species of conservation concern, and native fish species; and conserve and enhance native, wild trout populations at optimal levels.
- Assess large-scale habitat change.
- Maintain ecological integrity of natural communities and regional biodiversity by controlling invasive species and overabundant wildlife.
- Prevent illegal collection of rare reptiles and amphibians (including bog and wood turtles).
- Protect and enhance important and unique natural communities.
- Protect, enhance, and restore coldwater fish habitat and ecosystems.
- Conserve and enhance native, wild trout populations at optimal levels.
- Protect and enhance bald eagle nesting, foraging and roosting habitat.
- Promote public education and awareness, wildlife conservation, and participation in habitat restoration efforts on private land.

e. Conservation Actions

The actions below are identified as primary (1° or priority) and secondary (2°). Prioritization was determined by the Piedmont Plains Regional Landscape stakeholders during a meeting held on September 7, 2006 (see *Attachment F*). These actions, with a focus on the priority actions, should be incorporated in planning and project development in conjunction with the priority state-level objectives (goals) and strategies (actions).

Priority	Conservation Actions
Protect critical habitat identified in the Landscape Project	
1º	Increase the effective size and connectivity of permanently protected public lands and surrounding private lands. Use GIS measures, other remote sensing tools, and surveys to identify important corridors and smaller forest patches that connect larger, forest tracts. Target these areas to maintain a system of connected forest tracts within and between conservation zones including surrounding private lands via incentive programs and backyard habitat programs and targeted land acquisition through Green Acres, land trusts, and local land use policy and planning. Where possible, enhance and restore forested habitat through afforestation and revegetation. *(Enhance habitat – private lands; Corridors – sprawl, migratory birds; Protect habitat – Landscape Project)*
1º	Increase the number of forests managed to contain a mix of seral (successional) stages to provide habitat for a wide range of forest-dwelling species (e.g., woodland raptors, timber rattlesnakes, bobcats, Indiana bats, cerulean warblers, Canada warblers, winter wrens, ruffed grouse, and woodcock) within large contiguous tracts while maintaining suitability for area-sensitive species per the Forest Management Guidelines for Nongame Species in New Jersey. • The primary goal being to maintain or manage for large and contiguous areas of mature and near-mature forests with large trees, ≥ 80% canopy cover, and an uneven-age structure that is suitable for woodland nesting raptors (forest raptors). • Maintain and enhance floodplain and upland forests for forest-interior passerines (managing for mature forests with 65-85% canopy closure and structural diversity). • Selected areas of second-growth forested wetlands of moderate wildlife value should be allowed to mature and managed to create future barred owl and red-shouldered hawk habitat. • Canopy of 10-50% should be maintained at known timber rattlesnake dens and basking areas, and a canopy of >50% in foraging areas (these limits are generally naturally-occurring due to rocky and talus substrates). • Take action to minimize loss of older forest stands with large trees in large, contiguous tracts by protecting, maintaining, enhancing, and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management plans. *(Silviculture – Land management; Protect habitat – Landscape Project, migratory birds, rare wildlife)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote-sensing tools, and surveys to identify critical core forests (forest area >90 meters from the forest edge) and maintain species information in the Biotics database. Preserve and protect core forests through: • Regulations, land acquisition, and incentive programs for forest-dependent breeding species: forest-interior passerines and bobcats (≥ 10 hectares or 24.7 acres of core forest), forest raptors (≥ 100 hectares or 247 acres of contiguous forest), timber rattlesnakes (if unknown foraging habitat, a minimum of 1 ½ mile radius surrounding known den locations or 4,521 acres), and Indiana bats (≥ 6.8 hectares or 17 acres of contiguous forest) per the Forest Management Guidelines for Species of Conservation Concern in New Jersey. • Preservation efforts focused on area- and disturbance-sensitive breeding species in core forests located at least 2,500 meters from major highways. • Prevention of activities that cause permanent breaks in the forest canopy and lead to fragmentation (roads, development). • Identification of habitats adjacent to core forests that can be preserved and/or managed to increase the total size of forest habitat. • Collaboration with land managers, forest stewards, and private landowners to develop and implement best management practices *(Protect habitat – Landscape Project; Silviculture – land management)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify and assess core forested wetland and riparian/floodplain habitat for forest-dependent breeding species: forest raptors (red-shouldered hawk, northern goshawk, long-eared owl, barred owl), forest-interior songbirds (cerulean warbler, Louisiana waterthrush, Canada warbler, winter wren), bobcats, and Indiana bats. Take action to minimize habitat loss by protecting, maintaining, enhancing and/or restoring habitat on public and private lands through programs such as fee purchases, conservation easements, landowner incentives, and/or forest management and stewardship plans. *(Silviculture – land management; Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical core grassland habitats, assess their condition for nesting grassland birds, and maintain information. Identify protection strategies (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for mowing, conversion to warm-season grasses) to maintain large existing core areas of grassland in perpetuity. Focus on habitat patches that can be managed to enhance the total size of suitable grassland habitat. *(Protect habitat – Landscape Project, sprawl)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote sensing tools, and surveys to identify critical scrub-shrub habitats, assess their condition for nesting birds (golden-winged warbler and woodcock), and maintain information. Identify protection (e.g., landowner incentives, farmland preservation, acquisition) and management (timing restrictions for management, cooperative agreements with utility companies for maintenance of rights-of-ways) strategies to create interspersed scrub-shrub habitat in a grassland matrix. *(Conserve wildlife – rare wildlife; Enhance habitat – private lands; Agriculture – land management Protect habitat – sprawl, Landscape Project, development)*
1º	Refine existing Landscape Project species occurrence areas through research and, where lacking, develop new species occurrence areas as data on species requirements become available. Develop, review and improve species-habitat associations as new land use/land cover data become available. *(Protect habitat – Landscape Project)*
1º	Provide technical assistance and promote use of Landscape Project mapping in state land-use regulation, municipal planning, land acquisition priorities, and development of management strategies for permanently protected lands. *(Protect habitat – Landscape Project)*
1º	Collaborate with Hackensack, Hudson, and other Riverkeepers to carry out wildlife surveys including birds and invertebrates and populate Biotics database with species occurrence data. *(Conserve wildlife – rare wildlife)*
1º	Use GIS measures and other remote sensing tools, surveys, incentive programs, and public education to select and manage woodlots to maintain dead trees, reduce understory, and thin tree stands for open-woodland species and cavity-nesters such as red-headed woodpeckers. *(Silviculture – land management; Protect habitat – Landscape Project)*
1º	Use GIS measures, other remote sensing tools, and surveys to select woodlots to manage for structural forest diversity, especially shrub and subcanopy understory for forest passerines (cerulean warblers, Kentucky warblers, Louisiana waterthrushes, wood thrushes), priority reptiles, amphibians, and invertebrate species. *(Silviculture – land management; Protect habitat – Landscape Project)*
1º	Develop a GIS model of Indiana bat habitat to incorporate into the Biotics database. Identify appropriate protection strategies to maintain and enhance habitat (landowner incentives for protecting summer habitat, public education regarding importance of bat conservation, development of best management practices). *(Protect habitat – Landscape Project; Conserve wildlife – rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify coniferous and hemlock forests with >70% forest cover to protect and maintain them, through land acquisition, incentive programs, and public education, for priority bird species (black-throated green warbler, blue-headed vireo), reptiles and amphibians. *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Use GIS measures, other remote sensing tools, and surveys to identify coniferous and hemlock forests with >70% forest cover to protect and maintain them, through land acquisition, incentive programs, and public education, for priority bird species (black-throated green warbler, blue-headed vireo), reptiles and amphibians. *(Protect habitat – Landscape Project)*
2º	Collaborate with other agencies and conservation groups that collect data on wildlife populations (New Jersey Meadowlands Commission, Hackensack, Hudson, and other Riverkeepers, etc.) to identify and protect important habitats and populate Biotics database with species occurrence data. *(Protect habitat – Landscape Project)*
2º	Incorporate ENSP approved sightings data from nominated and approved Important Bird Areas into the Biotics database and Landscape Project mapping providing the sightings meet the ENSP Biotics and Landscape Project standards. *(Protect habitat – Landscape Project, migratory birds)*
2º	Use GIS measures, other remote-sensing tools, and surveys to identify forested stopover areas important for migrant forest raptors, passerines and bats during spring and fall migration. Use appropriate measures (e.g., regulations, land acquisition, incentive programs) to protect habitat and develop conservation forestry plans. *(Protect habitat – Landscape Project, migratory birds)*
Protect suitable aquatic/wetland/riparian habitat and water quality for wildlife and fish species of conservation concern	
1º	Protect water quality and aquatic-dependent species by appropriately designating Category 1 waters. *(Protect habitat – rare wildlife, fish)*
1º	Identify threats to vernal pools through systematic monitoring and devise strategies to protect species dependent upon vernal pool habitat. *(Conserve wildlife – rare wildlife)*
1º	Restore and maintain bog turtle habitat by providing incentives to landowners for long-term management of wet meadows utilizing FWS Region 5 BMPs for bog turtles (prescribed grazing, targeted herbicide application, stem cutting and removal, or a combination of these). *(Enhance habitat – private lands; Conserve wildlife – rare wildlife)*
1º	Maintain optimal biological buffers (beyond regulatory requirements) around wetlands, riparian and floodplain areas and minimize destruction per the NJ DEP Wetland Buffer Guidelines for Species of Conservation Concern in New Jersey (in prep). Stabilize wetland buffers and streambanks by encouraging plantings of native vegetation through public education, volunteer programs, and land managers to stabilize wetland buffers and stream banks and prevent erosion. *(Protect habitat – Landscape Project; Enhance habitat –private lands)*
1º	Wetlands used as breeding sites should be protected from chemical contamination, siltation, eutrophication, and other forms of pollution/contamination that could directly harm breeding species or their food supply (including birds, amphibians, and invertebrates). Evaluate protection efforts through regular monitoring of water quality. *(Conserve wildlife – contaminants)*

Priority	Conservation Actions (continued)
1º	Use GIS measures, other remote sensing tools, and surveys to identify and best management practices to maintain wetlands with dead trees for red-headed woodpecker and other cavity-nesters. *(Protect habitat – development; Silviculture – land management)*
1º	Increase the number of acres of freshwater wetlands managed for pied-billed grebes: create impoundments, maintain stable water levels during nesting season, restrict recreational activity, monitor contaminant levels; hemi-marsh conditions (approximately 50% water and 50% emergent vegetation cover) favored by grebes need to be maintained by periodic reversal of vegetation succession to open up some of the extensive stands of emergent vegetation, but suitable habitat for nesting needs to be maintained in nearby areas during wetland management. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Perform QA/QC of the NJDEP - DFW, Bureau of Freshwater Fisheries' FishTrack Database and query the database to determine distributions of fishes identified as special concern by the Delphi process. *(Monitor wildlife – fish)*
2º	Identify and protect important coldwater fish habitat and ecosystems through the Fishtrack database and water quality regulations. *(Protect habitat – Landscape Project, fish)*
2º	Develop and implement habitat improvement and restoration programs for coldwater fish species' habitats and ecosystems. *(Protect habitat – fish)*
2º	Work with local agencies and stakeholders to develop a landscape-scale plan for restoration of degraded emergent wetlands adjacent to the Meadowlands for colonial waterbirds, freshwater marsh birds and other wetland-dependent wildlife. *(Protect habitat – Landscape Project; Enhance habitat – private lands)*
2º	Identify and protect habitat for fish by plotting distributions of special concern fish species, and integrate those data into the Biotics database. *(Protect habitat – Landscape Project, fish)*
2º	Protect all large (> 4.9 hectares, 12.1 acres) freshwater wetlands from development, draining, pollutants from runoff and other forms of habitat loss and degradation through regulations, land acquisition, fee purchase, conservation easements, and incentive programs. *(Protect habitat – development, humans)*
2º	Increase the total acreage of restored and enhanced forest, emergent, riparian, and coastal wetlands (Hackensack Meadowlands) on permanently protected natural lands and surrounding private lands. *(Enhance habitat – private lands)*
2º	Maintain and enhance riparian areas and associated wetlands for bog turtles, songbirds, raptors, long-legged wading birds, riparian reptiles and amphibians and invertebrates; work to increase buffer sizes for riparian areas and wetlands in permits as appropriate to provide habitat for riparian species and travel corridors for wildlife in developed regions and prevent degradation of riparian habitats. *(Protect habitat – development; Enhance habitat – private lands)*
2º	Locate potential vernal pools through aerial imagery and surveys, conduct species surveys, and integrate certified vernal pools into the DEP regulations database and Landscape Project *(Protect habitat – Landscape Project)*

Priority	Conservation Actions (continued)
2º	Work with appropriate federal, state, and local agencies to maintain and enhance floodplain habitats for wildlife and storm water control. *(Protect habitat – development; Enhance habitat – private lands)*
Identify and protect important grassland and scrub-shrub habitats	
1º	Develop and implement best management practices for grasslands (areas with >75 % herbaceous and <25% woody vegetation) to improve habitat quality for grassland species and prevent destruction of nests and young, eggs and larvae by early mowing. Guide private and public landowners to implement best management practices for species dependent on grassland and other early succession communities. *(Agriculture – land management; Enhance habitat – private lands)*
1º	Use GIS measures, other remote sensing tools, and surveys to identify areas where scrub-shrub habitat (areas with >25% woody vegetation <20 feet in height) can be created and/or maintained with little impact to forested, wetland, and grassland habitats to maintain populations of shrub-dependent butterflies, reptiles, amphibians, and birds such as American woodcocks, ruffed grouse, and golden-winged warblers. *(Protect habitat – Landscape Project)*
2º	Maintain and enhance grassland habitats where they exist; do not expand or create grassland habitat at the expense of large forests that meet the needs of area-sensitive forest species. Acquire grassland habitat through direct purchase or easements; enlist private lands in preservation and management programs that offer long-term (no less than 5 years) stability of a matrix of grassland schemes including various stages of vegetative succession, where appropriate. *(Protect habitat – Landscape Project, development; Enhance habitat – private lands)*
2º	Develop, implement and evaluate best management practices (BMPs), through wildlife and habitat surveys, for utility rights-of-way (ROWs) to reduce impacts of vegetation management practices on wildlife and enhance scrub-shrub habitat. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*
2º	Collaborate with large landfill operations in New Jersey and New York to promote planting and management of capped landfills for grassland birds and evaluate effectiveness of management through surveys. *(Enhance habitat – private lands)*
Inventory and monitor endangered, threatened and special concern wildlife and fish	
1º	Through national, standardized survey protocols, utilizing citizen scientists, continue long-term monitoring and survey to collect baseline data (on protected lands) of raptors, songbirds, reptiles, amphibians, colonial waterbirds, and aquatic invertebrate populations, and incorporate new information into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Promote coordination of species monitoring and management efforts among conservation groups and state agencies in New Jersey by using standardized monitoring and data entry methods for birds and reptiles and amphibians. *(Monitor wildlife – long-term monitoring)*

Priority	Conservation Actions (continued)
1º	Collaborate with conservation organizations to inventory acquired land and update open space GIS layer as data become available. *(Monitor wildlife – long-term monitoring)*
1º	Use the Biotics database and Landscape Project to identify where species data and monitoring gaps exist. Design and implement coordinated surveys to acquire data in those areas, for example in the Hackensack Meadowlands. *(Monitor wildlife – long-term monitoring)*
1º	Survey to collect baseline data for endangered, threatened and special concern wildlife on permanently-protected natural lands. Incorporate all data into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Identify and inventory coastal and inland wetlands important for colonial waterbirds, long-legged waders, marsh-nesting birds, and waterfowl for which we have little data. *(Monitor wildlife – long-term monitoring)*
1º	Research and evaluate effectiveness of water quality management practices on wood and bog turtles, special concern amphibians, and aquatic invertebrates, particularly those practices associated with permitting and mitigation actions, and revise management actions where appropriate. *(Conserve wildlife – rare wildlife)*
1º	Determine population status and monitor trends of forest dwelling bat species in comparison to land use changes and alteration of habitat through long-term acoustical sampling and trapping/netting surveys. *(Monitor wildlife – long-term monitoring)*
1º	Identify and research water quality parameters for wood turtle and special concern amphibian populations. Assess impacts and incorporate into BMPs. *(Conserve wildlife – rare wildlife; Protect aquatic wildlife - humans, development)*
1º	Develop protocol to monitor abundance and distribution of colonial waterbirds north of the Coastal Landscape; incorporate these data and other data from the area into the Biotics database. *(Monitor wildlife – long-term monitoring)*
1º	Continue volunteer-based summer bat concentration surveys to locate maternity sites and determine roost characteristics. Trap bats at summer concentration sites to identify bat species; apply colored, plastic bands to Indiana bats to aid in recognition during hibernation surveys. *(Monitor wildlife – long-term monitoring)*
1º	Conduct telemetry study during summer months to determine roost characteristics and habitat requirements for Indiana bat maternity colonies. *(Protect habitat – Landscape Project)*
2º	Continue ground surveys of all known great blue heron rookeries every 3-5 years. Improve census methods to capture population and reproductive success metrics at a finer scale. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Establish a formal ground survey for inland colonies of colonial waterbirds, with a particular emphasis on black and yellow-crowned night herons. Once the survey is instituted, continue on a rotation of once every other year. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Systematically survey the Northern Piedmont Plains zone, particularly Teterboro Airport, Hackensack Meadowlands, Great Swamp NWR, and areas in Piscataway, South Plainfield, Warren, Harding, Hanover, West Caldwell, and Bergen County for songbirds, raptors, colonial waterbirds, grassland/open-field and wetland butterflies, and waterfowl. *(Monitor wildlife – long-term monitoring)*
2º	Using the Landscape Project, data from Biotics, and surveys, identify key breeding locations for cliff swallows and common nighthawks for immediate conservation efforts. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Conduct surveys to find more information about the species and management requirements of rails. *(Conserve wildlife –rare wildlife)*
2º	Use GIS measures, other remote sensing tools, and surveys to identify and inventory areas suitable for American burying beetles, Harris' checkerspots, ringed boghaunters, long-tailed salamanders, saltmarsh sharp-tailed sparrows, seaside sparrows, and purple finches. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
2º	Monitor and develop management strategies for coldwater fisheries in large reservoirs. *(Monitor wildlife – fish)*
2º	Systematically monitor fish populations, including native, wild trout, to keep management strategies current, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
2º	Conduct sampling to determine distribution, range, and habitat use of summer bats. *(Protect habitat - Landscape Project; Monitor wildlife – long-term monitoring)*
Prevent and reverse declines of wildlife populations	
1º	Work with managers to increase the number of impoundments managed to benefit bitterns, rails, ducks and some invertebrates by providing suitable foraging habitat and encouraging dense stands of emergent vegetation for nesting. *(Protect habitat – humans)*
1º	Continue research and systematic monitoring of Allegheny woodrat populations in the Palisades, including control of impact from disease. *(Monitor wildlife – long-term monitoring; Conserve wildlife – rare wildlife)*
1º	Maintain and enhance reptile and amphibian populations by increasing law enforcement (hiring additional officers) and penalties for illegal collection for the pet trade (bog and wood turtles) and working with state, county, and local DOTs to install raised roads or multiple culverts to reduce road mortality (e.g., along known box turtle breeding locations near roads). *(Conserve wildlife – rare wildlife; Protect habitat – roads; Corridors – roads)*
1º	Prevent declines in wildlife populations by utilizing the Delphi process to determine species that may warrant "special concern status" among taxa that has not undergone Delphi review (e.g., fish, moths). *(Monitor wildlife – fish; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
1º	Develop an appropriate survey method for tracking populations of chimney swifts and common nighthawks and conduct a thorough status assessment of these species. *(Conserve wildlife – rare wildlife)*
1º	Through systematic surveys, develop baseline data on wildlife species in urban and suburban habitats and incorporate species occurrence data into the Biotics database. Compile better life history information on species that use urban habitats, (e.g., nest predators and levels of nest depredation, breeding longevity and reproductive effort over time, characteristics of preferred nesting requirements, fidelity to breeding and wintering sites, and better assessment of migration routes). *(Monitor wildlife – long-term monitoring)*
1º	Collaborate with DOTs, NGOs, and volunteers to identify areas with known wildlife mortality issues including road crossings for breeding amphibians and roads with high incidences of road mortality (snakes, turtles, large mammals). *(Protect habitat – roads; Corridors – roads)*
1º	Use baseline data to develop management strategies for endangered, threatened and special concern wildlife on permanently protected natural lands. *(Conserve wildlife – rare wildlife)*
2º	Research effects of parasites and diseases on special concern fish species' populations. *(Conserve wildlife – rare wildlife)*
2º	DFW will collaborate with USDA to identify and prioritize, based upon species of greatest conservation need, areas where rapid response to an exotic pathogen introduction or incident is needed. *(Conserve wildlife – rare wildlife, invasives)*
2º	Identify groundwater recharge areas for blue-spotted salamander breeding sites and incorporate the sites into the Biotics database. *(Conserve wildlife – rare wildlife)*
2º	Develop and implement management actions to enhance populations of special concern and rare fish. *(Protect aquatic wildlife – humans)*
2º	Develop management strategies to assure the protection of the state's valuable wild coldwater fisheries. *(Protect aquatic wildlife – humans)*
2º	Work with DOTs and other appropriate federal, state, and local agencies to increase the number of sites where road crossing are improved to maintain and avoid disturbance to the natural streambeds and riparian habitat, to permit high volumes of water to flow freely, and to provide adequate travel corridors for terrestrial wildlife, while maintain stream flow for fish passage. Bridges that span rivers and streambeds and include floodplain habitat on either side of the span to provide travel corridors for terrestrial wildlife are preferred over culverts. *(Corridors – roads; Protect habitat – roads, fish)*
2º	Evaluate and assess the potential impacts of wind turbines to populations of bats. Carry out post-construction monitoring of both existing and future wind turbines to assess the actual impacts these structures have on bats. *(Protect habitat – humans; Conserve wildlife – rare wildlife)*

Priority	Conservation Actions (continued)
2º	Develop Indiana bat recovery plan in accordance with federal guidelines and strategies set forth in the USFWS Indiana Bat Recovery Plan (U.S. Fish and Wildlife Service, 1999). *(Conserve wildlife – rare wildlife)*
Assess large-scale habitat change every five years	
1º	Collaborate with NJ DEP's Bureau of Geographic Information and Analysis and Rutgers Center for Remote Sensing and Spatial Analysis to develop methods to update DEP's land use/land cover data every five years and perform critical habitat change analysis to assess trend in habitat loss and conversion.
Maintain natural biodiversity, community integrity and structure and ecosystem function by controlling invasive and overabundant species	
1º	Identify areas where invasive, non-indigenous plants and animals are either already established or are becoming established through GIS, surveys, public participation, and creating a system for reporting and qualifying new locations of invasive species. Prioritize areas for control measures according to the potential level of impact on the ecosystem and species of conservation concern and the likelihood of success. *(Conserve wildlife – invasives)*
1º	Continue or develop, implement and evaluate methods for both aquatic and terrestrial invasive species removal programs in critical wildlife habitats. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
1º	Work with public and private landowners and managers to employ appropriate physical, chemical, or biological control measures, or a combination of these, to reduce invasive non-indigenous plants and animals in areas that are identified as providing critical habitat for endangered, threatened, or priority wildlife species and are being threatened by invasive non-indigenous plants. *(Conserve wildlife – invasives)*
1º	Develop area-specific deer density or percent-reduction targets to reduce herd size to a sustainable level where forest regeneration is possible and to enhance forest health and biodiversity. *(Evaluate restoration – deer; Conserve wildlife - deer, rare wildlife)*
1º	The NJ Division of Fish and Wildlife, Bureau of Wildlife Management will consider forest health and biodiversity as one of the primary determinants in making deer management decisions regarding deer densities. Forest health and biodiversity will be determined by using long term monitoring of forest regeneration via a system of exclosures and vegetative sample plots (or other methods that will empirically and objectively measure the effect of deer herbivory) throughout New Jersey in order to evaluate habitat health in response to changing deer densities. DFW will recommend adjustments to existing Deer Management Zone deer densities goals and recommend changes to zone specific deer harvest and control strategies, as required in order to meet this objective. *(Evaluate restoration – deer; Conserve wildlife - deer)*

Priority	Conservation Actions (continued)
1º	Support projects, through funding and collaboration of effort, to eliminate aggressive invasive species found on private and public natural lands, especially in large forest and grassland tracts, wet meadow, marsh, emergent wetland, and aquatic habitats. Assess effectiveness of management techniques of invasive species removal on private and public lands. Assess impacts of aquatic invasives on freshwater mussels and implement management strategies to eliminate aquatic invasive species in sensitive or important habitats containing listed freshwater mussels. *(Conserve wildlife – invasives; Evaluate restoration – invasives)*
2º	Work with land management agencies to monitor for the spread of invasive insect species that jeopardize forest health. The species of primary concern include the Asian longhorned beetle and gypsy moth. Collaborate on appropriate control options for these pests and use appropriate control methods to reduce tree damage and limit the spread of infestations. *(Conserve wildlife – invasives)*
2º	Request permission from private landowners to establish vegetation monitoring plots, especially those interested in or currently enrolled in incentive programs. This will allow greater surveillance of deer impacts on private lands, provide landowners direct information about the health of their land, and provide greater data input into the deer harvest formula. *(Evaluate restoration – deer)*
Prevent illegal collection of rare reptiles and amphibians	
1º	Recruit and provide training for local law enforcement personnel that are willing to assist in the enforcement of endangered species laws. Develop a partnership between local law enforcement, USFWS Special Agents and NWR officers, National Park Service law enforcement, the NJ Division of Fish and Wildlife's Bureau of Law Enforcement, and the Division of Parks and Forestry Bureau of Law Enforcement to enforce protection of native wildlife from illegal collection (including bog and wood turtles) and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*
2º	ENSP biologists will be responsible for notifying the NJ Division of Fish and Wildlife's Bureau of Law Enforcement and the Division of Parks and Forestry Bureau of Law Enforcement and managers, where and when appropriate, of critical sites (nesting, basking, gestation, dens) to implement stringent enforcement of endangered species laws, including protection of wildlife from illegal collection (including bog and wood turtles, corn and pine snakes), persecution (timber rattlesnake), and human disturbance (off-road-vehicles). *(Protect wildlife – humans)*
Protect and enhance important and unique habitats	
1º	Identify (through Landscape Project, radar studies, IBAs, and surveys), protect (through incentive programs and land acquisition), and enhance (through incentive programs and best management practices) critical migratory stopover habitats, including but not limited to the Great Swamp NWR, Hackensack Meadowlands and other "oases" in urban and suburban areas. *(Protect habitat – migratory birds; Corridors – migratory birds)*

Priority	Conservation Actions (continued)
1º	Continue to support (through cooperative research and funding) the protection of critical habitat including, but not limited to, the large wetland complex of the Great Swamp National Wildlife Refuge, the Palisades Interstate Park and the globally rare species that occur there, the freshwater tributaries of the Delaware River. *(Protect habitat – development; Conserve wildlife – rare wildlife)*
2º	Federal, state, and local governments will work with the NJ DEP, Natural Heritage Program to cooperatively map significant natural communities in the Northern Piedmont Plains. *(Protect habitat – Landscape Project)*
Protect, enhance, and restore coldwater fish habitat and ecosystems	
1º	Develop and implement a habitat improvement and restoration program for coldwater fish. *(Restore aquatic habitat - development)*
1º	Monitor changes in water quality and assess the impacts to the native trout populations on specific waterways where native, wild, summer trout habitat may be in jeopardy due to declining water quality. *(Monitor wildlife – fish)*
2º	Continue to classify waters according to their suitability for native, wild trout, and provide recommendations for surface water classification changes to the Department of Environmental Protection. *(Protect habitat – fish)*
Conserve and enhance wild trout populations at optimal levels	
1º	Systematically monitor native, wild trout populations to revise management strategies when appropriate, aid in the identification of resource problems and issues, and demonstrate agency commitment to the management of aquatic resources. *(Monitor wildlife – fish)*
2º	Work with fisheries biologists and managers to evaluate current management practices that may negatively impact native, wild trout populations and revise management practices where appropriate to reverse declines or increase populations. *(Protect habitat – humans)*
2º	Protect native, wild trout populations by increasing the enforcement of established fishing regulations. *(Protect aquatic wildlife – humans)*
Protect and enhance bald eagle habitat	
2º	Use GIS measures, other remote-sensing tools, and surveys to identify critical habitats and assess their condition for bald eagle nesting and wintering populations. Develop specific protection strategies to address the threats (e.g., working with the National Wildlife Refuges and Palisades Interstate Park Commission to limit recreational opportunities in areas near eagle nests, closing sections of river shoreline to foot traffic and seasonal trail closures). *(Protect habitat – humans, Landscape Project)*
2º	Actively protect, monitor, and manage bald eagle nests and foraging areas, including posting signs in waterways to prevent disturbance by recreational activity and cooperation with private landowners. *(Conserve wildlife – rare wildlife; Protect habitat – recreational vehicles, humans)*

Priority	Conservation Actions (continued)
Promote public education and awareness and wildlife conservation	
1º	Educate public about the importance of keeping cats indoors through newsletters, press releases, brochures, presentations, web pages, etc. Work to develop a statewide policy for local communities to discourage managed cat colonies and trap, neuter and release programs; encourage academic research to evaluate impacts and success (i.e., reduction of cats over time) of existing managed cat colonies. *(Education – humans; Conserve wildlife – cats, subsidized predators)*
1º	Engage landowners and NJ citizens in protection and survey efforts for endangered species by increasing enrollment in landowner incentives, forest stewardship, backyard habitat management, and Citizen Science Program. *(Education – humans; Conserve wildlife – rare wildlife)*
1º	Collaborate with partners to develop innovative outreach educational programs to protect important habitats. Promote incentive programs to increase enrollment and encourage agricultural landowners to actively manage for grassland dependent species. *(Education – humans; Agriculture – land management)*
1º	Preventing establishment of non-indigenous species is the simplest and most cost-effective means of stopping invasions. Encourage native plant use in landscaping through public awareness and discouraging sales of non-native ornamental plants which are often a major source of non-indigenous species that invade natural plant communities. *(Education – humans; Conserve wildlife – invasives)*
1º	Develop and maintain educational brochures and posters and viewing opportunities for the public consistent with species recovery goals to enhance public awareness of wildlife conservation and environmental issues by cooperating with federal, state, and local government, and non-governmental organization partners. *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., about habitat requirements of chimney swifts and discourage use of chimney caps where possible (e.g., abandoned and unused chimneys) and prudent (for human and animal safety). *(Education – humans)*
2º	Educate homeowners, through newsletters, press releases, brochures, presentations, etc., on the proper eviction of house-dwelling bat populations and the importance of providing alternative roosting structures for maternity colonies. *(Education – humans)*
2º	Develop brochures and posters regarding the most aggressive, invasive non-indigenous plants and fish to educate and involve the public in detecting problem areas early while they are still manageable. Early recognition of the establishment of new populations is the key to successful control. *(Education – humans; Conserve wildlife – invasives)*
2º	Develop brochures and posters to educate the public and increase awareness of New Jersey's indigenous nongame and coldwater fish species. *(Education – humans)*

f. Potential Partnerships to Deliver Conservation

Private Landowners

- Maintain and enhance habitat through innovative partnerships with private landowners.
    - Implement best management practices that protect nesting and foraging sites of ospreys, peregrine falcons, woodland raptors, and grassland birds.
    - Utilize state, federal and local wildlife incentive programs that encourage the management of bog turtle, forest and grassland bird populations.
    - Through incentive programs, target private landowners surrounding public natural lands to manage land for mature forest in order to increase effective size and connectivity of forest patches.
    - Encourage farmers to preserve farmland through conservation easements or Transfer of Development Rights (TDRs) through partnerships with SADC, NJ DEP's Green Acres Program, The Nature Conservancy – NJ Chapter, local land trusts, and local municipalities for the conservation of bog turtle, forest and grassland bird populations.
    - Develop/maintain cooperative relationships with Teterboro Airport to encourage the management of grasslands for species of conservation concern.
    - Collaborate with municipal landfill operations to encourage grassland management on capped landfills.
    - Encourage landowners to allow afforestation of riparian zones utilizing landowner incentive programs.
    - Encourage landowners to manage nesting locations for chimney swifts and common nighthawks
    - Continue to coordinate maintenance and restoration of bog turtle habitat with private landowners on a volunteer basis.
    - Develop and implement landowner incentives for providing, maintaining, and protecting summer bat habitat.
    - Work with landowners to inventory their properties for the presence and severity of invasive non-indigenous plant populations. Work with them to develop effective control or eradication measures to protect critical wildlife habitats.
    - Work with landowners to maintain/enhance existing habitats where listed and special concern fish species and native trout populations occur.
    - In the context of landowner incentive programs such as LIP and Forestry Stewardship, work with landowners to develop and implement deer management plans that achieve desired deer densities.

Public

- Expand volunteer Citizen Scientist recruitment and activities.
    - Collaborate with conservation groups such as NJ Audubon Society, Conserve Wildlife Foundation, D&R Greenway, local land trusts, The Nature Conservancy – NJ Chapter and NJ Conservation Foundation, and other environmental, member-based organizations to recruit and train Citizen Scientists to locate, survey, and monitor wildlife habitats and populations in a systematic manner to achieve short and long term monitoring goals.
    - Collaborate with Conserve Wildlife Foundation, NJ Audubon Society, NJ Conservation Foundation, and other environmental, member-based organizations to

recruit and train Citizen Scientists to monitor vegetative plots (exclosures) on state lands for evaluation of vegetative structure in response to deer densities.
    - Recruit North American Butterfly Association volunteers to conduct surveys for Lepidoptera species
    - Involve Citizen Scientists in monitoring and assessment of chimney swift and common nighthawk occurrences and nesting areas.
    - Continue volunteer-based summer bat concentration surveys.
- Collaborate with NJ Audubon Society to educate public on the effects of free-roaming domestic cats and feral cats on wildlife species of conservation concern.
- Collaborate with Ducks Unlimited on studies involving migration and wintering ecology of waterfowl and other birds.
- Promote backyard habitat management for reptiles, invertebrates, migratory raptors, and passerines.
- Work with landowners to maintain/enhance existing habitats where listed special concern species occur.
- Work with landowners to maintain/enhance existing trout populations.

Wildlife Professionals

- Consult with entomologists to design and conduct surveys for Harris' checkerspots in grasslands and other appropriate habitat.
- Consult with animal control officers and extermination companies to implement proper removal of bats from houses and educate them on the importance of providing alternative roosting structures.

Conservation Organizations

- Develop a working relationship with the American Museum of Natural History Center for Biodiversity and Conservation in support of the existing Metropolitan Biodiversity Program.
- Partner with New Jersey Meadowlands Commission, Hackensack Riverkeeper, NJ Audubon Society, The Nature Conservancy – NJ Chapter, NJ Conservation Foundation, and conservation organizations to maintain and enhance habitats.
    - Protect osprey, peregrine falcon, and woodland raptor nesting and foraging sites.
    - Maintain emergent wetlands and open water for American bitterns, pied-billed grebes, sedge wrens, colonial waterbirds, and other marsh birds of concern as well as invertebrates (butterflies, dragonflies and damselflies).
    - Initiate and support eradication efforts of invasive plant and vertebrate species and exotic pathogens.
    - Develop a plan based on the survey results and habitat recommendations of the Hackensack Meadowlands study.
    - Protect and enhance critical habitat where listed or special concern wildlife and fish occur.
    - Conduct habitat surveys to determine geographic distribution and severity of invasions of invasive non-indigenous plants and invertebrates.
- Develop effective and coordinated monitoring and data-sharing methods with conservation groups to fill data gaps and enable new species data to be incorporated into Landscape Project and the Biotics database

- Collaborate with NJ Audubon Society on designating Important Bird Areas and fill gaps in baseline data.
- Consult with conservation organizations to develop educational programs.
- Encourage the use of priority habitat maps to guide land acquisition by conservation organizations through programs such as Green Acres Program, State Agricultural Development Committee (SADC) Farmland Preservation, and local land trusts.
- Continue participation in regional and national bat conservation efforts such as the Northeast Bat Working Group and the North American Bat Conservation Partnership.
- Continue to develop partnerships with fishing- and conservation-oriented organizations to increase conservation and restoration efforts on streams and lakes that provide trout fishing opportunities.
- Conservation organizations should act as advocates for legislation and regulatory reform that address integrating deer management goals into farmland tax assessment laws, farmland preservation programs, and other farm conservation programs.
- Work with land trusts to develop and implement deer management plans that achieve desired deer densities on preserved lands.
- Continue to develop partnerships with fishing and conservation oriented organizations to increase conservation and restoration efforts on streams and lakes supporting native trout populations.

Academic Institutions

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

Local Government, Other State and Federal Agencies

- Partner with local, state, and federal government agencies, including municipal and county planning boards, US Department of Agriculture (USDA) including Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS) - NJ Field Office, Green Acres Program, State Agricultural Development Committee (SADC) Farmland Preservation, and the Department of Community Affairs (DCA), Office of Smart Growth to protect, enhance, and create habitats and to protect NJ's native wildlife.
    - NJ Department of Environmental Protection's (DEP) Division of Fish and Wildlife (DFW) to maintain and protect osprey, peregrine falcon, woodland raptor and forest songbird nesting and foraging sites.
    - DFW and the USFWS to develop a plan to protect sensitive bog turtle sites from disturbance.
    - DFW to share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle sites.
    - Determine groundwater recharge areas for bog turtle habitats with the Division of Water Quality (DWQ) and the NJ Geological Survey. Expand efforts with DWQ to minimize impacts on water quality in these areas.
    - DFW, National Park Service, conservation organizations, and DEP's Lands Use Regulation Program (LURP) to work to protect and appropriately classify wetlands for special concern invertebrate, reptile, and amphibian populations on state, federal, and private lands.

- DFW to lead in the development of specific conservation plans develop specific conservation plans for special concern birds, reptiles and amphibians, and invertebrates on state lands.
- DFW to identify areas where scrub-shrub macro-sites can be created and/or maintained for American woodcocks and ruffed grouse without negatively affecting endangered, threatened, or special concern species and their habitats.
- Expand efforts to create habitat and implement best management practices that protect nesting and foraging sites of cavity-nesters, forest passerines and raptors, and other forest dwelling species on state lands and with natural resource managers, county and municipal utility authorities and planners; and where grassland/ scrub-shrub habitats already exist, enhance and maintain habitats for grassland and scrub-shrub/open field birds.
- DFW, conservation organizations, and land stewards to encourage greater buffers for important riparian and floodplain areas for forest passerines, reptiles, amphibians, and invertebrates with the DEP's Division of Watershed Management. Partner with them to investigate water quality and threats of contaminants/pollution.
- DFW to work with the NJDPF to enhance state forests for wildlife: uneven-age stand management, preserve standing and fallen dead biomass, eliminate forestry practices in wetland forests and manage adjacent upland forest for older-growth.
- DFW will integrate results of research on vegetative structure in response to deer densities into deer management strategies within deer management zones.
- DFW to work with land management agencies at the state, local, and federal levels to implement deer management plans and harvest quotas that achieve desired deer densities to maintain ecological integrity of natural communities.
- DFW and DEP's Division of Parks and Forestry (DPF) to work with the USFWS, Department of Defense, and National Park Service to develop effective plans to eradicate invasive, non-indigenous plants on federal and state lands and aquatic systems that are threatening critical wildlife habitats.
- DFW to work with USDA through NRCS and the WHIP program to control purple loosestrife and other invasive plants in critical wildlife habitats.
- DFW and DEP's Bureau of Water Monitoring and Standards to work together to recommend classification upgrades in water bodies where listed or special concern species occur.
- DFW to partner with local, county and state authorities to establish best management practices in areas where listed or special concern fish and wildlife species occur.
- DFW to work with the LURP to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
- DFW to continue to interact with other state agencies on operational, regulatory, and land-use issues to ensure adequate consideration is given to coldwater fish resources.
- DFW to continue to participate in the review of Land Use Applications that have the potential to impact wild trout populations and rare aquatic species.
- DFW to work with state and county mosquito commissions to prevent the use of insecticides and biological controls at known amphibian breeding sites.
- DFW to coordinate with the NJ Department of Transportation to reduce road mortality to reptiles and amphibians and large mammals and create wildlife under- and overpasses on new roads and road upgrades.

  - DFW to work with neighboring state fish and wildlife agencies to radio-track dispersing Indiana bats across state boundaries.
  - DFW to work with USDA-NRCS to ensure that deer management goals are integrated into farm conservation plans that include measurable outcomes.
  - DFW to work with land management agencies at state local and federal level to implement deer management plans that achieve desired deer densities on lands that they oversee.
  - DFW to work with USFWS and other state and federal partners to implement North American Waterfowl Management Plan as appropriate.
  - DFW to work with DEP's Bureau of Water Monitoring and Standards to recommend classification upgrades in water bodies where listed or special concern species occur.
  - Develop effective and coordinated monitoring and data-sharing methods with Great Swamp National Wildlife Refuge, Palisades Interstate Park, watershed management areas, and NJDFW to fill data gaps and enable new species data to be incorporated into Landscape Project and the Biotics database.
  - DFW to make recommendations on stream encroachment permit issues for areas where listed or special concern species occur.
  - DFW to continue to interact with other state agencies on operational, regulatory, and land-use issues to ensure adequate consideration is given to coldwater fish resources.
  - DFW to continue to participate in the review of Land Use Applications that have the potential to impact wild trout populations.
  - DFW, USFWS, and US Department of Agriculture to continue monitoring diseases that can potentially affect wild, native populations of special concern fish species.
  - DFW to continue working with fishing clubs and organizations, lake communities, hatcheries nationwide, and individuals permitted to stock fish in NJ's freshwater streams and lakes to ensure healthy stock is used to minimize the spread of disease and parasites to native fish species and to prevent the use or release of exotic species.
- DFW to lead in the development of educational materials for public and private landowners about wildlife of greatest conservation need and associated habitats.
- DFW, conservation organizations, and park commissions to expand public outreach through on-site programs and colonial waterbird viewing opportunities.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide habitat protection and land acquisition by federal, state, and local governments through programs such as DEP's Green Acres Program, State Agricultural Development Committee (SADC), Farmland Preservation, local land trusts, and through mitigation.
- DEP to encourage the use of the Landscape Project's critical habitat mapping to guide land use planning and zoning decisions by planning agencies at the federal, state, and local level.

g. Monitoring Success

- Conduct habitat assessment and monitor habitat change over time to assess efficacy of habitat management and restoration efforts.
- Incorporate standardized monitoring protocols, measures of success, and timeline for monitoring activities into mitigation projects and habitat conservation plans.
- Annually monitor abundance, productivity, distribution, and trends of bald eagle, osprey (biannually), peregrine falcon, and bog turtle populations; and colonial waterbird, grassland bird, and raptor communities.

- Monitor bald eagle contaminant levels.
- Continue the long-term monitoring of reptile and amphibian populations through the Herp Atlas Project, the Calling Amphibian Monitoring Program, the Vernal Pool Project, and the volunteer coverboard surveys.
- Conduct long-term monitoring of vegetative plots (exclosures) within state lands to assess vegetative success/ failure over time as deer densities change.
- Evaluate success of management activities on private land funded by state, federal and private landowner incentive programs.
- Work with volunteers, private landowners and conservation groups to monitor the success of eradication/control projects that target invasive non-indigenous plants, vertebrates, and invertebrates.
- Continue to monitor deer densities and deer harvest data.
- Develop indicator metrics for monitoring forest health and implement at the scale necessary to monitor effectiveness of deer management strategies.
- Continue monitoring diseases as outlined in the DFW's annual Fish Health Management Plan.
- Employ/implement adaptive management techniques for the goals and conservation actions established for species of greatest conservation need. Review effectiveness of research and management, and improve techniques as necessary.