5. Northern Atlantic Coastal

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

a. Habitats

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

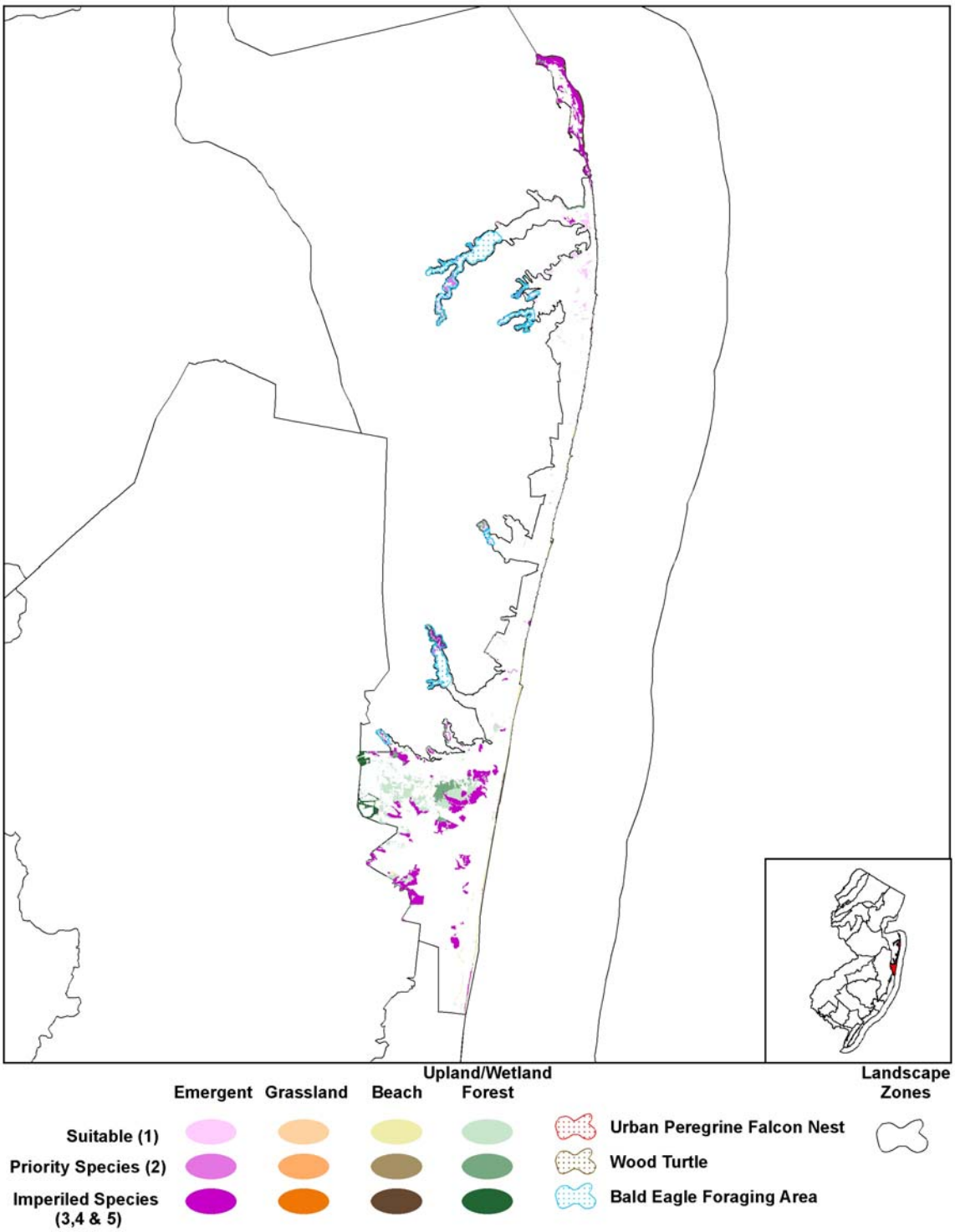
The most important conservation area of opportunity in the Northern Atlantic Coastal zone is the Sandy Hook Unit of Gateway National Recreation Area (including the "resident" U.S. Coast Guard Base). Other important areas include isolated bayside sections of the Edwin B. Forsythe NWR (Barnegat Division),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

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

b. Wildlife of Greatest Conservation Need

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

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



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

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

Wildlife Species and Associated Habitats of the Northern Atlantic Coastal Zone

Table C37. Federal Endangered and Threatened Species*

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

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

Table C38. State Endangered Species

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

X: Species occurs within the identified habitat.

Table C39. State Threatened Species

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

X: Species occurs within the identified habitat.

Table C40. Nongame Species of Conservation Concern

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

Nongame Species of Conservation Concern (continued)

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

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

Table C41. Game Species of Regional Priority

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

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

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

Table C42. Fish Species

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

Common Name	Water
Fish	
Hickory shad	X

X: Species occurs within the identified habitat.

Table C43. Game Species

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

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

X: Species occurs within the identified habitat

c. Threats to the Wildlife and Habitats

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

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

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

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

d. Conservation Goals

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

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

e. Conservation Actions

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

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

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

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

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

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

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

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

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

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

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

f. Potential Partnerships to Deliver Conservation

Private Landowners

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

Public

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

Wildlife Professionals

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

Conservation Organizations

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

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

Academic Institutions

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

Local Government, Other State and Federal Agencies

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

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

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

g. Monitoring Success

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