
National Park Service
U.S. Department of the Interior

Sandy Hook Unit
Gateway National Recreation Area
New York – New Jersey



ENVIRONMENTAL ASSESSMENT

Proposed Update of the 1992 Management Plan for the Threatened Piping Plover

on

Sandy Hook Unit Gateway National Recreation Area New York – New Jersey

January 2007

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SUMMARY

The National Park Service proposes to update Sandy Hook's *1992 Management Plan for the Threatened Piping Plover*. In order to more effectively fulfill its mission, Sandy Hook Unit of Gateway National Recreation Area (hereafter referred to as the Park) needs to address all of the shoreside species that currently occur at Sandy Hook that are listed either by the U.S. Fish and Wildlife Service (USFWS) or by the New Jersey Department of Environmental Protection (NJDEP) as threatened or endangered. Also proposed is to incorporate and better integrate existing requirements of the Endangered Species Act to address the declining piping plover population and pursue a more comprehensive and adaptive approach to shoreside species management.

After a scoping process to solicit public as well as state and federal regulatory agency input to assist the Park in identifying issues of concern, the range of alternatives was determined. Several alternatives were developed to directly address these issues as well as the Park's mission, objectives and compliance needs. This document presents these Alternatives as potential strategies to manage the Park's rarest beach (or shoreside) species. In this document, the Park evaluates several feasible means of conserving its rarest natural biological resources within the context of other important cultural, historical and recreational Park resources and interests. These rare plant and animal species are dependent upon the natural barrier island ecosystems and processes along the Atlantic coast, and their conservation depends upon addressing threats to their populations and habitats. The most pressing threats include loss or degradation of habitat, disturbance by human associated activities, and predation by fox and other animal predators.

Alternatives considered ranged from taking no action to taking additional actions to protect these species and their habitat. The three alternatives presented in this document represent feasible strategies to conserve these rare wildlife species within the context of other Park resources and its mission and requirements. The first alternative (Alternative A - No Action) proposes to continue present management with outdated plans and programs. The second alternative (Alternative B - the Preferred Alternative) attempts to balance threatened and endangered species management in context with other Park resources and provides for natural, cultural, historic resources and recreational activities to coexist. The Preferred Alternative reflects an attempt to balance the multiple use aspects of the Park and its mission and proposes to improve conservation of threatened and endangered species through enhanced education and enforcement of existing, designated protected areas and directly addresses key factors limiting their recovery (predation and human disturbance). Alternative C presents a more aggressive protection strategy that prioritizes threatened and endangered species at the potential cost of certain recreational activities and predators to improve threatened and endangered species recovery through increased restrictions to recreational uses and increased predator management. Discussions of other alternatives considered are also summarized.

These alternatives were then assessed and evaluated on the basis of their anticipated impacts on the Park's resources and issues. An assessment of each alternative is provided which outlines the effects of each one on the biological, recreational, socioeconomic and Park operational resources and environment.

TABLE OF CONTENTS

<i>I. PURPOSE AND NEED</i>	<i>1</i>
PURPOSE OF AND NEED FOR ACTION	1
PURPOSE AND SIGNIFICANCE OF THE PARK	4
PROJECT BACKGROUND	5
COMPLIANCE FRAMEWORK	7
ISSUE IDENTIFICATION	10
IMPACT TOPICS	17
<i>II. ALTERNATIVES</i>	<i>21</i>
ALTERNATIVE A: CONTINUE TO IMPLEMENT EXISTING MANAGEMENT ACTIVITIES FOR FEDERALLY-LISTED SPECIES (NO-ACTION)	23
ALTERNATIVE B: SHORESIDE SPECIES OF CONCERN CONSERVATION PLAN	25
ALTERNATIVE C: SHORESIDE COMMUNITY PROTECTION PLAN	37
MITIGATION MEASURES OF THE ACTION ALTERNATIVES	40
ALTERNATIVES CONSIDERED BUT DISMISSED	40
ENVIRONMENTALLY PREFERRED ALTERNATIVE	41
COMPARISON OF THE ALTERNATIVES	43
SUMMARY OF THE ENVIRONMENTAL CONSEQUENCES	45
<i>III. AFFECTED ENVIRONMENT</i>	<i>48</i>
NATURAL RESOURCES OF THE SHORESIDE ECOSYSTEM	48
Special Status Species	48
PREDATOR SPECIES	57
OTHER PLANT AND WILDLIFE SPECIES	62
WETLANDS	63
VISITOR EXPERIENCE	63
SOCIOECONOMICS	64
PARK OPERATIONS	65
<i>IV. ENVIRONMENTAL CONSEQUENCES</i>	<i>66</i>
METHODOLOGY	66
IMPACT ANALYSIS	68
Alternative A: No-Action	68
Alternative B: Shoreside Species of Concern Conservation Plan	74
Alternative C: Shoreside Community Protection Plan	82
<i>V. CONSULTATION AND COORDINATION</i>	<i>89</i>
<i>VI. LIST OF PREPARERS</i>	<i>92</i>

VII. REFERENCES	93
LITERATURE CITED	93
PERSONAL COMMUNICATIONS	110
EXPLANATION OF ACRONYMS	112
VIII. APPENDICES	114

- APPENDIX A.** On-Going Nps Management Actions For The Piping Plover, Northeaster Beach Tiger Beetle, And Seabeach Amaranth
- APPENDIX B.** NPS Non-discretionary Conservation Measures Relating to the Completed Multiuse Pathway and Interim Beach Fill Projects
- APPENDIX C.** NPS Non-discretionary Conservation Measures Relating to the Proposed Sand Slurry Pipeline Project
- APPENDIX D.** Existing Management Activities at the Sandy Hook Unit, Gateway NRA, to Conserve Threatened and Endangered Shoreside Species
- APPENDIX E.** Management Goals for the Preferred Alternative
- APPENDIX F.** Special Status Species Background
- APPENDIX G.** Potential Impacts to Each Special Status Species from Alternatives A, B and C

LIST OF TABLES

	Page
Table 1. Shoreside threatened and endangered species known to or potentially occurring at Sandy Hook, along with the conservation status and species group of each.	3
Table 2. Conservation measures for the piping plover as identified in NPS (1992).	6
Table 3. Summary of the alternatives considered.	21
Table 4. Special Status Species included in the proposed Shoreside Species of Concern Conservation Plan. Scientific names are listed in parentheses.	26
Table 5. Summary of the alternatives considered or rejected, and the reason for rejecting those that were dismissed from further review.	41
Table 6. Comparative Summary of Alternatives, including whether each meets the needs of the project.	44
Table 7. Qualitative comparison of Park-wide environmental consequences for the three alternatives. (Note: All potential effects were determined after comparison with the existing conditions (baseline environment) or No Action Alternative.)	45
Table 8. Breeding piping plover abundance and productivity for New Jersey from 1995-2006. (Sources: USFWS 2005a, and Pover <i>et al.</i> 2006).	49
Table 9. Regional and national piping plover abundance and distribution for 1990 to 2005. Numbers in parentheses are preliminary estimates. (Sources: USFWS 2004, 2005c, and 2006a)	51
Table 10. Northeastern beach tiger beetle populations in Chesapeake Bay, with a core population on both shores of Virginia and a smaller population in Maryland. Note that these populations reflect surveyed metapopulations and that all population totals are minimum values since none of the years include surveys from the entire Chesapeake Bay population. The 2004 data do not include a complete survey of the eastern shore of Virginia and thus are a minimum population total for that location. (Source: M. Drummond, USFWS, personal communication)	53
Table 11. Abundance and distribution of seabeach amaranth throughout its range from 1987 through 2005. (Source: D. Suiter, USFWS, personal communication)	54
Table 12. Abundance and distribution of seabeach amaranth in New Jersey since its discovery in 2000. (Sources: D. Suiter and W. Walsh, USFWS, personal communications)	55
Table 13. Least tern abundance in New Jersey from 1996 to 2005. (Source: NJDEP unpublished data)	56
Table 14. Predation management at Sandy Hook has trapped and relocated 415 animals from 1985 to 2006. The Gulls column represents the number of injured gulls sent to rehabilitators or relocated in the park. The Dogs column represents the number of dogs captured and either adopted or removed by animal control. The Fox column represents the number of fox hit by cars, trapped and relocated outside the park, sent to rehabilitators and released outside the park or euthanized. The Cats column represents the number of cats trapped and either adopted or transferred to the SPCA or Animal Control. The Raccoons column represents the number of raccoons relocated within the park away from shorebird nesting areas. (Source: NPS unpublished data)	61

Table F-1. Piping plover abundance and productivity from 1990-2006. (Source: NPS, unpublished data)	F-4
Table F-2. Sandy Hook piping plover nest data for 1990-2006. (Source: NPS, unpublished data)	F-5
Table F-3. 2006 Breeding piping plover abundance and productivity by nesting area. (Source: NPS, unpublished data)	F-5
Table F-4. Causes of piping plover nest loss by site in 2006. (Source: NPS, unpublished data)	F-7
Table F-5. Number of pairs of piping plover at Sandy Hook nesting sites 1990-2006. (Sources: NPS, unpublished data, and Jenkins and Pover, 2003b)	F-8
Table F-6. Abundance and distribution of Northeastern beach tiger beetles at Sandy Hook since its reintroduction in 1994. (Sources: NPS, unpublished data, and USFWS 2005a)	F-18
Table F-7. Seabeach amaranth abundance and distribution at Sandy Hook since its discovery in 2000.	F-23
Table F-8. Least tern nesting productivity at Sandy Hook from 1996 to 2006. (Source: NPS and NJDEP unpublished data)	F-30
Table G-1. Potential effects of the No Action Alternative on Special Status Species in the Sandy Hook Unit of Gateway NRA.	G-1
Table G-2. Potential effects of the Preferred Alternative on Special Status Species in the Sandy Hook Unit of Gateway NRA.	G-3
Table G-3. Potential effects of Alternative C on Special Status Species in the Sandy Hook Unit of Gateway NRA.	G-5

LIST OF FIGURES

	Page
Figure 1. The Sandy Hook Unit of Gateway NRA and the location of existing protection areas within the Park. The position of the shoreline changes often, and the protection areas shift accordingly; the shoreline at North Beach has shifted west since the protection area was mapped.	24
Figure 2. Bird nesting areas are protected from human disturbance by symbolic rope fencing with posts and signs posted every 50 ft (15 m). Photo by Terwilliger Consulting, Inc., June 27, 2006.	28
Figure 3. The Park uses larger educational signs such as this one to inform visitors of the beach nesting birds, their protection under the Endangered Species Act, and the seasonal beach closures to pets and certain human activities. Photo by Terwilliger Consulting, Inc., June 27, 2006.	29
Figure 4. Alternative C proposes to close the the Fishing Trail Access area at the north end of the Park to recreational use from March 15 through Labor Day.	39
Figure 5. Breeding piping plover abundance (bar) and productivity (line) for New Jersey from 1995-2005.	50
Figure D-1. Protection zones are separated from the Recreation zones (public beaches) by symbolic fencing and signs. Photo by Terwilliger Consulting, Inc., June 27, 2006.	D-2
Figure F-1. Piping plover nest locations at Sandy Hook in 2005.	F-2
Figure F-2. Number of nesting pair of piping plovers (bar) and annual productivity (line) for Sandy Hook, 1990 to 2005.	F-4
Figure F-3. Historical piping plover nesting areas (1995-2005) on Sandy Hook.	F-6
Figure F-4. Tidal maintenance of ephemeral pools at high tide on North and Coast Guard Beaches. Photo by Terwilliger Consulting, Inc., July 19, 2001.	F-8
Figure F-5. More than half of the bayside shoreline of Sandy Hook is stabilized with hard structures such as this riprap at Fort Hancock. Photo by Terwilliger Consulting, Inc., July 13, 2006.	F-12
Figure F-6. The NPS initiated the use of electrified exclosures on piping plover nests in 2004 to deter predators. The electrified fence is powered by a 6 volt battery (seen on the left). An incubating piping plover is visible in the lower center portion of the photo, within the wire exclosure. Photo by Terwilliger Consulting, Inc., June 27, 2006.	F-14
Figure F-7. Seabeach amaranth abundance at Sandy Hook since its discovery in 2000.	F-23
Figure F-8. Distribution of seabeach amaranth plants at Sandy Hook.	F-24

I. PURPOSE AND NEED

PURPOSE OF AND NEED FOR ACTION

The purpose of the proposed action is to update Sandy Hook's 1992 *Management Plan for the Threatened Piping Plover* with a plan that effectively meets the missions of the National Park Service and the Sandy Hook Unit of Gateway National Recreation Area (NRA) and complies with the Park's shoreside threatened and endangered species requirements. The plan needs to more effectively address and include all of the shoreside species that currently occur within Sandy Hook that are listed either by the U.S. Fish and Wildlife Service or by the New Jersey Department of Environmental Protection (NJ DEP) as threatened or endangered. It is also necessary to compile and incorporate existing management requirements for compliance with the Endangered Species Act to more effectively address declining piping plover populations and other rare species recovery. Following the Park's mission but with limited resources to conserve natural resources in the overall context of the Park, it is an opportunity to pursue a more integrated, comprehensive, and adaptive approach to conservation of these rare shoreside species.

The current management plan for threatened or endangered species at Sandy Hook was prepared in 1992. It is no longer adequate because more current biological information on the piping plover (NPS 1992; *Charadrius melodus*) and relevant shoreside conservation has been collected and published since this time. The U.S. Fish and Wildlife Service (USFWS) revised the Recovery Plan for the piping plover (USFWS 1996a) and the local population has declined in recent years. In fact, the piping plover is currently listed by the New Jersey Division of Fish and Wildlife as endangered. The Sandy Hook population of nesting piping plovers has fallen to near record lows in 2005 and 2006, and their reproductive productivity declined 63% from 1999 to 2004 and remains below the USFWS recovery goal of 1.5 chicks per nesting pair.

The 1992 management plan is also outdated and insufficient because it describes management actions for only one of the three locally occurring species listed as "threatened" under the federal Endangered Species Act. When the existing plan was completed, the Northeastern beach tiger beetle (*Cincindela dorsalis dorsalis*) and the seabeach amaranth plant (*Amaranthus pumilus*) had not yet been identified at Sandy Hook. The Northeastern beach tiger beetle was reintroduced to Sandy Hook in 1994. The seabeach amaranth reappeared at Sandy Hook in 2000, after nearly a century of absence from New Jersey beaches. These two species meet the federal "threatened" criteria. They also meet the New Jersey criteria for "endangered." In addition, the red knot (*Calidris canutus rufa*) was listed recently as a federal Candidate species and is considered threatened in New Jersey. The USFWS has issued four Biological Opinions to the Park describing protective measures for the piping plover, Northeastern beach tiger beetle, and seabeach amaranth resulting from Park activities, few of which are contained in the 1992 management plan (USFWS 1994b, 2002a, 2003a, and 2005a).

Moreover, the 1992 management plan includes a measure that restricts NPS beach driving to emergency use only during the piping plover nesting season, but the Natural Resources staff currently need to drive on the beach occasionally to monitor and manage the piping plover

nesting areas. Therefore the 1992 management plan needs to be updated to reflect the current management practices of the NPS and to minimize official vehicle use to the greatest extent practicable.

As natural resource management continues to evolve towards a more ecological framework, it makes sense to include species identified by New Jersey Division of Fish and Wildlife as threatened or endangered. Actively managing for these species may help prevent the need to identify them as federally recognized threatened or endangered species. Threatened and endangered species also occur in the waters of Sandy Hook, including sea turtles and whales (Table 1). These species are only occasional visitors to the Park, and as a result the proposed action does not intend to address these species. Similarly, threatened and endangered species found within the Park that do not occur in or rely upon shoreside habitats are not included in the proposed action and would be protected as per federal and state regulations. Marine mammals and sea turtles, for example, are occasional visitors to the Park and are managed in accordance with existing federal and state regulations and management plans.

This Environmental Assessment (EA), prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and its implementing regulations (40 CFR Parts 1500-1508), is intended to analyze the management alternatives (the Preferred Alternative, the No Action Alternative, and other reasonable alternatives), as appropriate, and their impacts on the environment. The EA has also been prepared in accordance with the National Park Service's Director's Order #12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001a, b); and Section 106 of the National Historic Preservation Act of 1966 as amended, and its implementing regulations (36 CFR Part 800).

OBJECTIVES

The Preferred Alternative must meet the following objectives:

- Not impair Park resources or values;
- Be consistent with the Park's General Management Plan (as amended; NPS 1979, 1990), *NPS Management Policies* (NPS 2001c, 2006), and Director's Order #12 (NPS 2001a, 2001b);
- Fulfill the non-discretionary requirements of existing Biological Opinions with the USFWS under the Endangered Species Act of 1973 (USFWS 1994b, 2002a, 2003a, and 2005a);
- Be adaptable to changing conditions over time;
- Increase beach nesting bird productivity;
- Have measurable performance indicators;
- Feasible to obtain any necessary state and/or federal permits; and
- Feasible to obtain and/or maintain funding.

DECISION TO BE MADE

The NPS, after considering the environmental information presented in this EA and the public comments, and after consulting with other agencies, will make a decision about revising and

Table 1. Shoreside threatened and endangered species known to or potentially occurring at Sandy Hook, along with the conservation status and species group of each. Species shown in **bold** are included in the proposed action.

Species	Species Group	Federal Status	State Status
American bittern <i>Botaurus lentiginosus</i>	Bird (waterbird)		Endangered (breeding)
Red knot <i>Calidris canutus rufa</i>	Bird (shorebird)	Candidate	Threatened (breeding)
Piping plover <i>Charadrius melodus</i>	Bird (shorebird)	Threatened (Atlantic Coast)	Endangered
Bald eagle <i>Haliaeetus leucocephalus</i>	Bird (raptor)	Threatened	Endangered (breeding); Threatened (non-breeding)
Black rail <i>Laterallus jamaicensis</i>	Bird (waterbird)		Threatened
Black-crowned night heron <i>Nycticorax nycticorax</i>	Bird (waterbird)		Threatened (breeding)
Yellow-crowned night heron <i>Nyctanassa violacea</i>	Bird (waterbird)		Threatened
Osprey <i>Pandion haliaetus</i>	Bird (raptor)		Threatened (breeding)
Black skimmer <i>Rynchops niger</i>	Bird (waterbird)		Endangered (breeding); Threatened (non-breeding)
Least tern <i>Sterna antillarum</i>	Bird (waterbird)		Endangered
Roseate tern <i>Sterna dougallii</i>	Bird (waterbird)	Endangered	Endangered
Northeastern beach tiger beetle <i>Cincindela dorsalis dorsalis</i>	Beetle	Threatened	Endangered
Seabeach amaranth <i>Amaranthus pumilus</i>	Plant	Threatened	Endangered
Sea-milkwort <i>Glaux maritima</i>	Plant		Endangered
Seabeach evening primrose <i>Oenothera humifusa</i>	Plant		Endangered
Seabeach knotweed <i>Polygonum laucum</i>	Plant		Endangered
Loggerhead turtle <i>Caretta caretta</i>	Sea turtle	Threatened	Endangered
Green turtle <i>Chelonia mydas</i>	Sea turtle	Threatened	Threatened

Species	Species Group	Federal Status	State Status
Leatherback turtle <i>Dermochelys coriacea</i>	Sea turtle	Endangered	Endangered
Hawksbill turtle <i>Eretmochelys imbricata imbricata</i>	Sea turtle	Endangered	Endangered
Kemp's Ridley turtle <i>Lepidochelys kempii</i>	Sea turtle	Endangered	Endangered
Sei whale <i>Balaenoptera borealis</i>	Whale	Endangered	Endangered
Blue whale <i>Balaenoptera musculus</i>	Whale	Endangered	Endangered
Fin whale <i>Balaenoptera physalus</i>	Whale	Endangered	Endangered
Northern right whale <i>Eubalaena glacialis</i>	Whale	Endangered	Endangered
Humpback whale <i>Megaptera novaeangliae</i>	Whale	Endangered	Endangered
Sperm whale <i>Physeter macrocephalus</i>	Whale	Endangered	Endangered
Shortnose sturgeon <i>Acipenser brevirostrum</i>	Fish (anadromous)	Endangered	Endangered

updating the 1992 *Management Plan for the Threatened Piping Plover* to incorporate state-listed shoreside species, be adaptive to changing conditions over time, and reverse recent declines in beach nesting bird productivity (in a manner consistent with NPS missions and policies), or maintaining the existing suite of management activities for federally-listed shoreside species in the Park.

PURPOSE AND SIGNIFICANCE OF THE PARK

The mission of the National Park Service is to preserve “unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations” (NPS 2006). Congress designated the Gateway NRA in 1972 as part of an effort to bring the national park system and its preservation and protection of outstanding natural and cultural resources closer to major cities (NPS 1990). The purpose of Gateway NRA is to “preserve and protect for the use and enjoyment of present and future generations an area possessing outstanding natural and recreational features” (NPS 1979).

Sandy Hook is one of three management units within the Gateway NRA, covering more than 2,000 acres of land and inland water bodies along the northern New Jersey coast, plus adjacent estuarine and marine waters for one-quarter mile around the peninsula. The military installations at Fort Hancock, at the northern half of Sandy Hook, were a part of the harbor defenses for New York from the 1890s through World War II. Sandy Hook was also used for military training, as

a proving ground, an ordnance depot, a reserve encampment, and a summer camp for the National Guard (NPS 1990).

Sandy Hook is a 7-mile, barrier beach spit along the northern New Jersey coastline that provides recreational opportunities for up to 2.5 million visitors annually. One of New Jersey's most heavily-used beaches, Sandy Hook remains one of its best examples of a "natural" beach community and shoreline. Sandy Hook contains roughly 100 acres of saltwater and freshwater marshes and a 284 acre holly maritime forest which is the northernmost and largest natural stand of holly on the Atlantic Coast (NPS 1990).

The entire Sandy Hook peninsula is listed on the National Register of Historic Places as National Historic Landmark pursuant to the National Historic Preservation Act of 1966, as amended (16 USC Sections 470 et seq.), which includes the Spermaceti Cove lifesaving station, the Sandy Hook Lighthouse, Fort Hancock and the Sandy Hook Proving Ground. The U.S. Coast Guard still maintains a facility at the northern end of Sandy Hook. There are currently seven (7) educational, research, government and private organizations, and academic institutions who occupy twenty (20) buildings at Fort Hancock through leases, cooperative agreements and special use permits with the NPS.

As one of the few relatively undeveloped stretches of coastline in New Jersey, and as a popular beach recreation area for the New York City metropolitan area, Sandy Hook protects significant natural and cultural resources within a very high visitor use environment. The Sandy Hook Unit of Gateway NRA (hereafter referred to as the Park) is located along the Atlantic flyway for migratory birds, providing a "critical stopover and foraging habitat for migrating songbirds and raptors" as well as nesting and foraging habitat for a number of threatened, endangered and declining shorebird and waterbird species (NJDEP 2005, p. 134). The Sandy Hook Bay Complex has been designated as one of Audubon's Important Bird Areas, noted for its nesting populations of piping plover, least tern, common tern, and black skimmer and its migratory and midwinter concentrations of waterfowl. An average of more than 60,000 waterfowl, 20,000 shorebirds and 5,000 raptors seasonally use the Sandy Hook Bay Complex. Approximately 85% of the shorebirds migrating through Sandy Hook are sanderling (*Calidris alba*), ruddy turnstone (*Arenaria interpres*) and semipalmated sandpipers (*Calidris pusilla*) (Chiple *et al.* 2003).

PROJECT BACKGROUND

The Park proposes an updated and adaptive management framework for the NPS to balance the needs of shoreside threatened and endangered species with recreational use of their habitats at the Sandy Hook Unit of Gateway NRA. The NPS contracted with Terwilliger Consulting, Inc., to assist in the development of the updated management plan and the EA.

1992 Management Plan for the Threatened Piping Plover

Sandy Hook's *Management Plan for the Threatened Piping Plover* and its accompanying Environmental Assessment outlined twelve conservation measures to protect the federally-threatened piping plover. These conservation measures are summarized in Table 2.

The 1992 plan identified limited habitat, human disturbance and predation as the major factors limiting productivity of breeding piping plovers at Sandy Hook. Vegetation encroachment, flooding and oil spills were identified as minor threats. The preferred management alternative recommended the limitation of human activity, expansion of protected habitat, conditional closure of the intertidal zone, and implementation of the management recommendations summarized in Table 2.

Table 2. Conservation measures for the piping plover as identified in NPS (1992).

- Continue to sign and fence nesting sites on all beaches to discourage human intrusion within the nesting area.
- Intensify the existing trapping program of plover predators (i.e., cats, etc.) by increasing the number of live traps. Traps should be set in dense vegetation pockets at all three nesting areas. Traps, baited with fish-base cat food, should be checked every morning. All traps should be in full operation by mid-March.
- Continue to prohibit all vehicle use of the beach during full plover season, including NPS vehicles, except in emergency situations.
- Prohibit dogs and other pets, leashed and unleashed, from beaches from March 15 to August 30.
- Prohibit kite flying from March 15 to August 30, except at designated areas.
- Utilize piping plover nest exclosures where appropriate, in accordance with the USFWS's exclosure guidelines, and in cooperation with the NJ Endangered and Nongame Species Program. Triangular or circular exclosures with a perimeter of approximately 30-feet, 5-foot high (allowing 1-foot to be buried under the sand), and constructed of wire mesh (2-inch x 4-inch mesh size) should be utilized. Support stakes should not be higher than the fence to discourage perching by avian predators. Heavy-duty monofilament line should be strung across the top of the exclosure in a lattice pattern, with each grid measuring 6-inches.
- Completely close the intertidal zone in front of nesting sites during critical stages of the plover breeding cycle and when heavy public use is anticipated (e.g., July 4th weekend).
- Implement measures to ensure timely trash collection at piping plover nesting beaches. Opportunistic predators are attracted to the presence of trash.
- Continue efforts to gather data on piping plover productivity and human disturbance, particularly at North Beach and South Gunnison Beach. Data should be collected from the start of the nesting season and should include all dimensions of human disturbance including, but not limited to, walking, "strolling," bathing, fishing, boat mooring, etc. Disturbances should be accounted by specific type, intensity and duration.
- Monitor the Critical Zone for piping plover nesting activity. Implement all existing and recommended management actions at the Critical Zone on suitable piping plover habitat that may occur there.
- Investigate measures to control vegetative encroachment.
- Continue public information and education opportunities. Investigate the potential of giving visitors a list of rules and regulations regarding beach-nesting birds when they enter the National Park. Seek opportunities to show plover and tern videos and distribute literature where possible. Continue to utilize plover and tern wardens and to provide orientation to these and other seasonal NPS employees.

Requirements of the ESA

Section 7 of the Endangered Species Act (ESA, 16 USC 1531 et seq.) mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the NPS determines that an action may adversely affect a federally listed species, consultation with the USFWS is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. If it is determined that a proposed federal action is likely to result in the "take" of a listed species, then the USFWS may describe those conditions which must be met in order for an activity to proceed. "Take" includes the harming or harassing of species in ways which interfere with its normal breeding, feeding, or sheltering behaviors.

There are currently four formal consultations between the Park and the USFWS that resulted in Biological Opinions, each of which described non-discretionary conservation measures, reasonable and prudent measures (RPM), and terms and conditions that the NPS must implement to protect federally-listed species at Sandy Hook. The reintroduction of the Northeastern beach tiger beetle to Sandy Hook beaches is covered in USFWS (1994b). The construction of a multiuse pathway for bikers, pedestrians and others is covered by USFWS (2003a). An Interim Beach Fill project to mitigate erosion in the Critical Zone of Sandy Hook is covered by USFWS (2002a). Finally, an as yet unbuilt sand slurry pipeline to manage long-term shoreline erosion issues at the Critical Zone is covered by USFWS (2005a). The existing non-discretionary conservation measures, reasonable and prudent measures, and terms and conditions proscribed in these previous ESA consultations between the USFWS and NPS are listed in Appendix A.

In addition, the NPS consulted with the USFWS and NJDEP on the Fort Hancock Rehabilitation Project on potential impacts to threatened and endangered species (NPS 2003). Mitigation measures recommended by the two resource agencies for potential impacts to piping plover and osprey were accepted by the NPS. An Osprey Management Plan was drafted as a result of this consultation (NPS 2000).

COMPLIANCE FRAMEWORK

The following laws and associated regulations provided direction for the design of alternatives, the analysis of impacts, and the formulation of mitigation/avoidance measures:

National Environmental Policy Act of 1969 (NEPA) (Title 42 U.S. Code Sections 4321 to 4370 [42 USC 4321-4370]). The purposes of NEPA include encouraging "harmony between [humans] and their environment and promote efforts which would prevent or eliminate damage to the environment...and stimulate the health and welfare of [humanity]". The purposes of NEPA are accomplished by evaluating the effects of federal actions. The results of these evaluations are presented to the public, federal agencies, and public officials in document format (e.g., environmental assessments and environmental impact statements) for consideration prior to taking official action or making official decisions. Implementing regulations for the NEPA are contained in Part 1500 to 1515 of Title 40 of the U.S. Code of Federal Regulations (40 CFR 1500-1515).

Clean Water Act of 1972, as amended (CWA)(33 USC 1251-1387). The purposes of the CWA are to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters". To enact this goal, the U.S. Army Corps of Engineers has been charged with evaluating federal actions that result in potential degradation of waters of the U.S. and issuing permits for actions consistent with the CWA. The U.S. Environmental Protection Agency also has responsibility for oversight and review of permits and actions which affect waters of the U.S. Implementing regulations describing the USACE's CWA program are contained in 33 CFR 320-330. Neither the No Action Alternative nor the proposed action would affect wetlands or other waters of the U.S. and no USACE permit is required.

Coastal Zone Management Act of 1972 (CZMA)(16 USC 1451-1464). The CZMA presents a congressional declaration to "preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations". The CZMA also encourages "states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone". In accordance with the CZMA, the State of New Jersey has adopted state laws and regulations, including a Coastal Zone Management Plan, that is administered by the New Jersey Department of Environmental Protection (NJDEP). All actions proposed by federal, state, and local agencies must be consistent or compatible with the Coastal Zone Management Plan, as determined by the NJDEP. The NPS has requested concurrence from the NJDEP that the proposed action is consistent with the New Jersey Coastal Zone Management Plan.

Endangered Species Act of 1973, as amended (ESA)(16 USC 1531-1544). The purposes of the ESA include providing "a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." According to the ESA, "all Federal departments and agencies shall seek to conserve endangered species and threatened species" and "[e]ach Federal agency shall...insure that any action authorized, funded, or carried out by such agency...is not likely to jeopardize the continued existence of any endangered species or threatened species." The U.S. Fish and Wildlife Service (non-marine species) and the National Marine Fisheries Service (marine species, including anadromous fish and marine mammals) administer the ESA. The effects of any agency action that may affect endangered, threatened, or proposed species must be evaluated in consultation with either the USFWS or NMFS, as appropriate. Implementing regulations which describe procedures for interagency cooperation to determine the effects of actions on endangered, threatened, or proposed species are contained in 50 CFR 402.

Cultural Resources Regulations and Policies. The National Park Service is mandated to preserve and protect its cultural resources through the **Organic Act of 1916 (USC title 16)** and such specific legislation as the **Antiquities Act of 1906 (16 USC 431)**, the **National Historic Preservation Act of 1966, as amended (16 USC 470)**, the National Environmental Policy Act of 1969, as amended (42 USC 4321,4331,4332), the **Archeological Resources Protection Act of 1979 (16 USC 470)**, and the **Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001)**. In addition, the management of cultural resources is guided by the Advisory Council on Historic Preservation's implementing regulations regarding "Protection of

Historic Properties ” ((36 CFR 800), the Secretary of the Interior’s *Standards for the Treatment of Historic Properties* (1995) and *Guidelines for the Treatment of Cultural Landscapes* (1996), Chapter 5 of the National Park Service’s *Management Policies* (2006), and the National Park Service’s *Cultural Resources Management Guideline* (DO-28, 1998). Section 106 of the National Historic Preservation Act requires that federal agencies having direct or indirect jurisdiction over undertakings consider the effect of those undertakings on resources either listed in or eligible for listing in the National Register of Historic Places. It also requires that the Advisory Council on Historic Preservation, state/territorial/tribal historic preservation officer(s), and other concerned parties be provided an opportunity to comment.

NPS Organic Act and Management Policies. The Organic Act that created the National Park Service (NPS) states that NPS will “...conserve the scenery and the natural and historic objects and the wildlife therein and...provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (16 USC 1, the National Park Service Organic Act; NPS 2001). The Organic Act prohibits the impairment of Park resources and values unless a particular law explicitly directs otherwise (NPS 2006).

Gateway NRA developed a *General Management Plan* in 1979 to guide management of the NRA (NPS 1979); the plan was amended for the Sandy Hook Unit in 1990 (NPS 1990). The *General Management Plan* (GMP) specifically calls for the protection of primary dune systems, dune vegetation, rare and endangered wildlife species, and waterbird nesting and foraging sites. Management of these natural resources will “ensure perpetuation of natural communities and protection of fragile or significant features” and “no recreational uses will be allowed” in those areas (NPS 1979, p. 81). One of the management objectives of the 1990 *General Management Plan Amendment* is to “[e]mphasize natural processes in resources management as well as habitat enhancement for significant floral species, shore nesting birds, and other fauna,” including the piping plover (NPS 1990, p. 8).

In 2001, the NPS issued Director’s Order #12 to guide Conservation Planning, Environmental Impact Analysis, and Decision-making (NPS 2001a) and an accompanying Handbook (NPS 2001b) on implementing the requirements of the National Environmental Policy Act of 1969. Director’s Order #12 recommends an interdisciplinary approach to decision-making, basing decisions on technical and scientific information, and fully involving the public and other stakeholders in evaluating proposed NPS actions (NPS 2001a). The *2001 NPS Management Policies* (NPS 2001c) and their revision in 2006 (NPS 2006) provide detailed guidance on land protection, natural resource management, cultural resource management, wilderness stewardship, interpretation and education, and visitor use and facilities within the National Park System.

Environmental Justice. Executive Order 12898 directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. Consistent with this mandate, the population in the vicinity of Sandy Hook is evaluated to determine the potential for the project to adversely affect minority and/or low-income populations. The demographic study area comprises all census tracts adjacent to Sandy Hook. The analysis shows no significant concentrations of low income households or minority populations within the census area that would be impacted by the action alternatives.

Coastal Barriers Resources Act of 1982 (CBRA) (96 Stat. 1653; 16 USC 3501 et seq.).

Congress passed the Coastal Barriers Resources Act in 1982 to address problems caused by coastal barrier development. The law encourages the conservation of hurricane prone, biologically rich coastal barriers by restricting Federal expenditures that encourage development, such as Federal flood insurance through the National Flood Insurance Program. This system is made up of a defined list of undeveloped coastal lands and associated aquatic environments that serve as barriers protecting the Atlantic, Gulf, and Great Lakes coasts. The John H. Chafee Coastal Barrier Resources System currently includes 585 units comprising nearly 1.3 million acres and about 1,200 shoreline miles. There are also 271 Otherwise Protected Areas (OPA), a category added by the **Coastal Barrier Improvement Act of 1990 (P.L. 101-591; 104 Stat. 2931)** to add a layer of Federal protection to coastal barriers already held for conservation or recreation, such as national wildlife refuges, national parks and seashores, state and county parks, and land owned by private groups for conservation or recreational purposes, and discourage development of privately owned inholdings. The only Federal funding prohibition within OPAs is Federal flood insurance. Sandy Hook is included in this system as an OPA. Three important goals of this act are to minimize loss of human life by discouraging development in high risk areas, reduce wasteful expenditure of federal resources, and protect the natural resources associated with coastal barriers.

Migratory Bird Treaty Act, as amended (MBTA) (16 USC 703-712). The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.

New Jersey Endangered Species Conservation Act of 1973 (New Jersey Statutes Annotated, 1937; Titles 13 and 23). The New Jersey Endangered Species Conservation Act established laws to protect and restore threatened and endangered species in New Jersey and allowed the New Jersey Department of Environmental Protection, Division of Fish and Wildlife, to establish the Endangered and Nongame Species Program (ENSP) to restore and maintain these species. The law was designed to protect species whose survival in New Jersey is imperiled by loss of habitat, over-exploitation, pollution, or other impacts. Actions prohibited by the Act include “the taking, possession, transportation, exportation, sale or offer for sale or shipment of any nongame species of wildlife on the endangered species list.” The Act also states that “[e]xcept as provided by law, rule, or regulation or by the code, no person shall pursue, hunt, take, capture, kill, attempt to take, capture or kill, or have in possession, living or dead, a wild bird.” Various habitat protection measures are also prescribed by the Act.

ISSUE IDENTIFICATION

A variety of issues relating to the management of shoreside threatened and endangered species at Sandy Hook were identified through the initial scoping process. The NPS invited specialists from key federal and state resource and regulatory agencies to an interagency scoping meeting held at the Park on June 27, 2006. The proposed action was presented and recommendations on issues that should be addressed were solicited. The USFWS, NJDEP, U.S. Army Corps of

Engineers (USACE) New York District Environmental Branch, and U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) attended. Biological and management issues were identified. The group also provided valuable information regarding the direction and development of the range of alternatives, affected environment, impact topics, and environmental consequences.

The issues identified by the agency specialists could be grouped into four main categories. They are:

- Biological issues
- Visitor use / recreation
- NPS management activities
- Administrative issues (e.g., project objectives, alternatives content)

The second portion of the initial scoping process was an Open House on July 13, 2006, at the Park and a 30 day comment period. The intent was to share preliminary project information with anyone who was interested and to ensure that important issues had not been missed. The Open House and a request for written comments was issued July 5, 2006, in a Press Release, which appeared in several local papers including the Asbury Park Press. An invitation to the Open House and a request for written comments was mailed directly to approximately 100 interested parties, including a variety of Park partners, stakeholders and local government agencies. The proposed action was placed on the NPS Planning Environment and Public Comment (PEPC) website for public distribution on August 23, 2006.

The public scoping comment period lasted for 30 days and resulted in 19 comments from the public, 10 submitted at the Open House and 9 submitted in writing during the comment period. The comments received fit into one or more of the following categories, with the number of comments received per topic in parentheses:

- Human disturbance (8)
- Beach closure areas (8)
- Declining piping plover productivity (3)
- Predators and predation management (3)
- Public use of or access to the beach (3)
- Administrative issues (e.g., public participation in project development) (3)
- NPS management activities (3)
- Need for public education (3)
- Including state-listed species (2)
- Habitat protection and/or enhancement (2)
- Threats from oil spills and/or pollution (2)
- Concerns not within the scope of this project (e.g., the Fort Hancock Rehabilitation Project) (7)

Along with the need to include state-listed species in the Park's current management, the effects of predation on beach bird productivity, the effectiveness of Park operations, vegetation management, human disturbance to bayside and northern beaches, and the relationship of this

project with the Fort Hancock Rehabilitation Project were identified as issues of concern by stakeholders and the public. Other minor issues identified by single commentors during scoping include public education and outreach, the potential impacts of populations of threatened and endangered species reintroduced to the Park (i.e., Northeastern beach tiger beetle) expanding into neighboring communities, opportunities for habitat restoration and enhancement for special status species to increase resource availability at the Park, consistency with state and federal regulations, monitoring to identify the abundance and distribution of shorebirds (e.g., piping plover, red knot) during migration, and the proposed action's relationship to sediment management within the Park and adjacent areas.

Inclusion of State-listed Species

The inclusion of state-listed shoreside species such as the least tern, red knot, and American oystercatcher was identified as a major issue for the proposed action to address. These state-listed species often share the same habitats and threats as the federally-listed species on which the Park's current management plan focuses, and protection measures for one species is likely to afford protection to multiple species. State-listed species potentially occurring within Sandy Hook's shoreside habitats include the least tern (*Sterna antillarum*), osprey (*Pandion haliaetus*), black skimmer (*Rynchops niger*), seabeach knotweed (*Polygonum laucum*), seabeach evening primrose (*Oenothera humifusa*), sea milkwort (*Glaux maritima*) and others (Table 1).

Park Operations

Scoping comments identified some of the Park's current management operations and policies as potential contributors to the productivity decline of beach nesting birds at Sandy Hook. A second issue identified in scoping comments was the Park's ability to fully protect and enforce existing restrictions on human disturbance in protected areas. The NPS currently has a carry in – carry out trash policy, where Park visitors must carry out their trash with them when they leave the Park. The Park does not maintain trash cans or dumpsters for the waste collection. Resource and regulatory agencies raised the issue of how effective this policy is to keep trash out of protected nesting areas and to prevent the attraction of mammalian and avian predators (by removing potential supplemental feeding sources) during scoping. The use of beach raking to maintain the public beaches was also identified as a potential issue in scoping comments, as it reduces or eliminates the presence of natural wrack material that provides foraging habitat and a seed source for beach/dune plants.

Human Disturbance to Bayside and Northern Beaches

An increase in the observed use of the Park's bayside beaches for kite surfing and its disturbance to shorebirds and waterbirds using bayside habitats was identified as a concern by Park staff and the public. Kite surfing involves using large kites (6 to 65 feet or more) to propel small surfboards with human riders into the air, and the large size of the kites has been observed by some visitors to cause the flushing and flight of all the birds in the area, who presumably perceive the kite as a large predator. As this sport increases in popularity, one commenter stated that its users have formed new pathways in the bayside vegetation to reach suitable staging and launching areas. Along the Park's northern beaches, two protected areas are separated by a

narrow reach where visitors can use the beach. A perceived lack of enforcement of the boundaries between the protected and public beaches in this area was identified by commenters as an issue that this EA should address.

Effects of Predation on Beach Bird Productivity

A recent significant decline in the productivity of piping plovers (63% from 1999 to 2004) and other beach nesting birds was identified both internally and externally to be of major concern. An increase in predation by “smart” mammalian predators was identified as the most likely cause of the decline in productivity, although avian predators also affect the productivity of nesting birds. “Smart” predators are those that exploit management tools such as nest exclosures, symbolic fencing and other protective measures to locate prey. Another predation issue identified during the scoping process was the expansion of red fox into Sea Bright, which some commenters believe came from the Park, in 2006; these fox then caused predation losses of piping plovers in Sea Bright. An additional issue is that the NJDEP has historically issued trapping and relocation permits to the NPS to selectively remove red fox from Sandy Hook to other federal managed lands. NPS was informed on February 16, 2006, that these permits would no longer be issued to the Park as of 2007 because it is no longer consistent with the NJDEP *Policy on the Relocation of Wildlife* (NJDEP 1996). As a result, the NPS faces the issue of increased predation without the ability to relocate problem fox outside of the Park.

Vegetation Management

Beach nesting birds generally require nesting habitat with sparse vegetation. The encroachment of vegetation into nesting areas was identified as an issue of concern as a potential source of habitat alteration over time. Some coastal management practices were also noted to destroy or prevent the formation of transitional bands of sparse vegetation, which provide benefits to beach nesting birds, requiring a careful balance in maintaining the most beneficial amounts of vegetation. The occurrence and distribution of invasive and exotic species is also a potential issue affecting habitat quality on both oceanfront and bayside habitats.

Relationship to Fort Hancock Rehabilitation Project

A number of the public comments received regarding the proposed action and EA were centered around its relationship to the Fort Hancock Rehabilitation Project. This issue is discussed separately below under the Relation to Other Plans, Policies and Actions section.

Relation to Other Plans, Policies and Actions

The Park currently is managed under a 1979 General Management Plan (GMP) that was amended in 1990 (NPS 1979, 1990). In accordance with that plan, the NPS is undertaking or planning to undertake several projects in the Park. These projects are (or would be) separate undertakings and are not interrelated or interdependent with the actions considered in this Environmental Assessment.

Projects recently completed at the Park include the rehabilitation of several historic structures, including the Sandy Hook Lighthouse keeper's quarters and former officers' residences #18 and #20; construction of a Multi-use Pathway from the Park entrance to the Fort Hancock Ferry terminal; exterior rehabilitation of a former barracks building (Building #25) to serve as the Park Visitor Center and for curatorial storage and display; raising a portion of the roadway in flood prone areas south of the Ranger Station to improve drainage and reduce road closures following storm surges and overwash; and the construction of an Interim Beach Fill Project at the Critical Zone. Projects currently proposed at the Park include: (1) Fort Hancock Rehabilitation Project, (2) Sand Slurry Pipeline Project, (3) construction of a permanent ferry dock, (4) replacement of the Route 36 bridge at the entrance to the Park, and (5) development of a vegetation management plan. None of the above projects are prerequisites to the updating of the Park's shoreside threatened and endangered species management plan and would be pursued regardless of the outcome of the plan.

Fort Hancock Rehabilitation Project

The Fort Hancock Rehabilitation Project will achieve the vision articulated in the park GMP and GMP Amendment (NPS 1979, 1990) creating a Gateway Village as a year-round community for education, research, conference and meeting facilities, professional offices and overnight accommodations and food service. Of the 100 historic buildings on Fort Hancock, which is on the National Register of Historic Places as a National Historic Landmark (NPS 2003), twenty-two (22) of the 37 buildings involved in the project would be used for offices (one with meeting space and two with lab space), five (5) for hospitality uses, two (2) for YMCA / Recreation use, one (1) each as a café / bar, post office, commissary, theater / meeting space (the Theater), cafeteria / meeting space, reception / event space (the Chapel), and kitchen. Twenty (20) additional buildings are currently in use by Park partners through leases, cooperative agreements or special use permits, which would not change under the proposed project.

One of the 37 buildings included in the Fort Hancock Rehabilitation Project is currently occupied by the American Littoral Society, which would convert to an historic lease. The remaining 36 buildings are included in a master lease that builds upon and is compatible with the current uses of Fort Hancock. This group of buildings constitutes approximately 300,000 square feet of space.

As part of the Rehabilitation Project, the landscape of Fort Hancock would also be restored to historically appropriate standards, which are summarized in Nowak and Foulds (2005). An additional 800 people are anticipated to use Fort Hancock on weekdays (NPS 2003). The total number of beach parking spaces for Sandy Hook is limited to 4,300 as defined by the Park's GMP (NPS 1990) with the total number of spaces in the Park limited to 5,000 (NPS 2003). The Fort Hancock Rehabilitation Plan proposes to make the use of limited amount of parking more efficient by relocating spaces from an overflow parking area at the north end of the peninsula to smaller areas on the eastern edge of Fort Hancock, which will be closer to the most popular beach areas than at present. Six hundred and sixty five (665) parking spaces would be removed from Parking Lot K, near the Nine Gun Battery, allowing that area to be restored to natural grassland habitat. These 665 spaces would be distributed in six (6) new and several expanded

existing parking lots around Fort Hancock making them more useful to Fort Hancock visitors on weekdays and beach users on summer weekends (NPS 2003).

The Fort Hancock Rehabilitation Project was reviewed by the USFWS and NJDEP. The NPS determined that the Rehabilitation Alternative would have a minor, long-term impact to piping plovers by increasing the number of visitors to the Park and a minor, short-term impact to osprey through the removal of nests on chimneys. The USFWS found that, with seasonal restrictions, the proposed project was not likely to adversely affect the piping plover, Northeastern beach tiger beetle or seabeach amaranth. Since osprey have nested on the chimneys of Buildings 13, 14, and 114 (the Officer's Club), all of which are proposed for rehabilitation, the NJDEP recommended mitigation through the construction of two new nesting platforms and the repair of four platforms – three platforms along the interior of the Park south of Atlantic Drive and another platform in the marsh north of Spermaceti Cove (NPS 2003). The USFWS recommended that exclusionary devices be placed atop the chimneys to discourage osprey from rebuilding their nests at those locations. The NPS has already constructed the two new platforms at North Pond and Old Trailer Park and repaired the other four platforms.

These mitigation measures to minimize impacts to the state-listed osprey are a component of all the Alternatives as they represent existing management activities of the Park. The USFWS recommended further consultation regarding potential impacts to federally-listed species if the Rehabilitation Project proposed to conduct construction along the Hartshorne Drive Corridor Zone within 100 m of occupied piping plover habitat during the nesting season (April 15 through August 15); the NPS agreed to comply with this seasonal restriction.

Sand Slurry Pipeline Project

The Sand Slurry Pipeline Project would maintain shoreline equilibrium within the Park with minimal impact on the beach communities. The project objective is to simulate the natural sand transport and equilibrium along Sandy Hook in the context of the adjacent stabilization perturbation (i.e., the seawall at Sea Bright that extends into the Park). This would require a pipeline which borrows sand from the northern, accreting portion of the Hook (Gunnison Beach) and deposits it on the eroding southern beach (Critical Zone). The system would provide NPS the flexibility of recycling up to 100,000 cubic yards (cy) annually (as needed) to protect Park infrastructure. The project would maintain sufficient beach width to protect facilities and maintain vehicle access to the Park. A slurry pipeline would be aligned with the existing road corridor in a previously disturbed area and utilize a series of pumps to transport the sand slurry with minimal heavy equipment at each end. An EA was finalized in 2004 (NPS 2004a) and construction of the sand slurry pipeline is pending funding.

The NPS determined that the proposed Sand Slurry Pipeline Project may have adverse impacts on threatened and endangered species, but also a beneficial effect on the piping plover and other rare flora and fauna by creating additional habitat in the Critical Zone (NPS 2004a). The NPS completed a formal consultation with the USFWS under Section 7 of the Endangered Species Act for the project. The NPS concluded that the Sand Slurry Pipeline Project could potentially adversely affect the piping plover, seabeach amaranth, seabeach knotweed, and least tern (NPS 2004b). The NPS determined that the Sand Slurry Pipeline Project was not likely to adversely

affect the Northeastern beach tiger beetle, finback whale, humpback whale, and right whale, and could potentially but was not likely to adversely affect sea turtles (NPS 2004b). The USFWS concluded that the project was not likely to jeopardize the continued existence of the piping plover, seabeach amaranth, or Northeastern beach tiger beetle (USFWS 2005a).

The NPS agreed to comply with all of the conservation measures, Reasonable and Prudent Measures, and Terms and Conditions of the USFWS Biological Opinion to avoid, minimize and mitigate for impacts to federally threatened and endangered species (USFWS 2005a). All of these non-discretionary measures are incorporated into each of the alternatives described in this EA.

Permanent Ferry Dock

Plans for ferry service facility development and landside connections to Park areas across Gateway units have been in the Park's General Management Plan since 1979 (NPS 1979). Gateway NRA currently is developing a Park-wide system of ferry docks to provide alternative and emergency access to Park Units. Summer visitor ferry service has been in operation between Sandy Hook and points in Manhattan since 1997. Each year one ferry operator has provided a spud barge used for docking. Use of the barge by other operators or by Park cooperators must be negotiated with the provider. Ferry service has largely been limited to weekends. The number of trips has varied between 2 and 4 per day and in most instances public demand for the service exceeded the capacity for each run. The total number of ferry passengers has varied depending on summer weekend weather but has ranged between 5,000 and 9,000 visitors a season over the past five years. These limited facilities threaten the continued success of ferry service at Sandy Hook.

The preliminary project proposal includes a floating ferry dock; a pier with a breakwater to attenuate waves; improved parking; and docking space for NPS law enforcement vessels and some research vessels used by Park partners who maintain facilities at Fort Hancock (e.g., NOAA, The New Jersey Marine Sciences Consortium, the Marine Academy of Science and Technology). The project could potentially allow for the current Manhattan to Highlands ferry to stop at Fort Hancock year round depending on interest or need, but use by commuters is not part of the proposed project. A preliminary NEPA scoping meeting was held in December 2001 with regulatory agencies and the Department of Transportation regarding the proposed permanent ferry dock and service. Rutgers University is currently conducting some environmental condition surveys at the site in order to develop information needed as part of an anticipated, but as yet uninitiated, EA or Environmental Impact Statement (EIS). Construction of a permanent ferry dock at Sandy Hook is not likely to be funded within the next five years. The project's potential impacts on threatened and endangered species would be evaluated at the appropriate times during the project development and NEPA process, and consultations with the USFWS, NOAA and NJDEP would be conducted at those times.

Route 36 Bridge Replacement

At the time of this writing, the New Jersey Department of Transportation (NJDOT) is developing plans to either rehabilitate or replace the Route 36 bridge into Sea Bright and Sandy Hook. As

part of a replacement project, the southern portion of Hartshorne Drive in the Park, the Sandy Hook Fee Plaza, and adjacent parking lot A would be reconfigured and repaved. Pedestrian / bicycle overpasses to connect the Park's Multiuse Pathway with the bike path in Sea Bright and Highlands Boroughs would be constructed. The project would utilize portions of parking lot B as a staging area in the off season during bridge construction. The NJDOT is preparing appropriate NEPA documentation for the project, and consultation with the USFWS regarding the project's potential impacts to threatened and endangered species and with the NPS on potential impacts to Park resources are ongoing.

Vegetation Management Plan

The NPS's Northeast Region Inventory and Monitoring Program recently conducted a vegetation survey of Sandy Hook, and Gateway NRA is preparing a vegetation management plan for the Sandy Hook Unit. The vegetation management plan would include management activities to maintain the historic landscape character of Fort Hancock and the Sandy Hook Proving Grounds (see Nowak and Foulds 2005), and to control invasive or exotic species. The plan's potential impacts on threatened and endangered species, including federally and state listed plant species, would be evaluated at the appropriate times during the project development and NEPA process, and consultations with the USFWS, NOAA and NJDEP would be conducted at those times.

IMPACT TOPICS

Important issues or impact topics were identified through internal scoping within the NPS, a scoping meeting held with relevant federal and state agencies, a public scoping meeting and comment period, and review of previous consultations with regulatory agencies such as the USFWS, NOAA and NJDEP.

Impact Topics Analyzed in this Document

Impacts of the alternatives on the following topics are presented in this EA:

- Effects on Natural Resources of the Shoreside Ecosystem
 - Special Status Species
 - Targeted predator species
 - Other plant and wildlife species
 - Wetlands
- Effects on Visitor Experience
 - Recreation opportunities
 - Safety
 - Changes in ability to enjoy wildlife
- Socioeconomics
- Park Operations

Impact Topics Dismissed from Further Analysis in this Document

The following impact topics, either would not be affected or would be affected in a negligible fashion by the alternatives evaluated in this EA. In addition, these topics are not considered to be highly controversial. Therefore these topics have been dismissed from further consideration or analysis. Negligible effects are effects that are localized and immeasurable or at the lowest levels of detection in a local or regional context.

Sediment Management

Sand Slurry Pipeline Project

None of the alternatives described in this EA propose to impact any feature of the Sand Slurry Pipeline Project. All of the alternatives incorporate the existing conservation measures, Reasonable and Prudent Measures, and Terms and Conditions for threatened and endangered species agreed to during the formal consultation between the NPS and USFWS for the Sand Slurry Pipeline Project. No modifications to the Sand Slurry Pipeline Project are proposed in the No Action or Preferred Alternatives. Alternative C, however, could potentially utilize sediment from the Sand Slurry Pipeline Project to restore sandy beach habitat along the bayside of the Park; this would have a negligible effect on the sediment management within the Park since the sediment volumes needed to restore beaches on the bayside would be relatively low and would not overrule the sediment needs to protect the Critical Zone. Any proposals to restore beaches on the bayside of the Park would undergo separate project development, NEPA compliance, and coordination with the regulatory agencies (e.g., USFWS, NOAA, USACE, NJDEP).

Sandy Hook Channel

The U.S. Army Corps of Engineers (USACE), New York District, maintains the Sandy Hook (navigational) Channel that is periodically dredged and extends through Sandy Hook Bay from the Navy Pier at Earle to wrap around the northern tip of the Sandy Hook peninsula to the Atlantic Ocean. The channel crosses the Park's one-quarter mile seaward boundary at the north end of the peninsula. The maintenance of this 800 foot wide and 35 feet deep (authorized depth) channel has a negligible effect on the Park's beaches (N. Psuty, Rutgers, personal communication), and its dredged material is not disposed of in the Park. Because neither the operations and maintenance of the navigation channel nor its dredged material significantly effect the Park, none of the management activities of the alternatives described in this EA would effect the sediment management of the USACE channel.

Cultural Resources

Fort Hancock Rehabilitation Project

None of the alternatives described in this EA propose to impact any cultural resource at Sandy Hook, including the historic buildings and features of Fort Hancock and the Sandy Hook Proving Ground. The Fort Hancock Rehabilitation Project previously underwent separate Endangered Species Act consultation with the USFWS and NJDEP. All of the alternatives presented in this

EA incorporate the existing mitigation measures for osprey (repair and construction of nesting platforms) and piping plover (seasonal restrictions on construction in the Hartshorne Drive corridor) agreed to during the development of the Fort Hancock Rehabilitation Project by the NPS, USFWS and NJDEP. No modifications to the Fort Hancock Rehabilitation Project are proposed in any of the alternatives for an updated shoreside threatened and endangered species management plan, especially since that project is limited to upland areas not covered by the proposed shoreside threatened and endangered species management plan. Similarly, the implementation of the Fort Hancock Rehabilitation Project is not anticipated to affect any of the alternatives discussed in this EA, since it is considered part of the existing management framework of the Park (see Alternative A: No Action).

Submerged Cultural Resources

The NPS Submerged Cultural Resources Unit conducted a magnetometer survey of areas offshore of Sandy Hook in September 1997. As part of the survey, various historical maps were examined along with other sources during the compilation of a Geographic Information System (GIS) database. The potential locations of eight documented shipwrecks were identified and plotted based on the historic maps. As a result of shoreline accretion on the north and northeast ends of Sandy Hook, these shipwrecks may now be buried onshore, although no testing has been conducted to confirm the existence of these potential archeological resources. The alternatives considered in this EA would not cause the erosion or removal of sand, or the covering by sand, of known submerged cultural resource sites.

Air Quality

The federal Clean Air Act as amended (42 USC 1221 et. seq.) regulates the nation's air quality, and Section 309 of the Clean Air Act requires that the Environmental Protection Agency review NEPA documents prepared by federal agencies to assess potential impacts of proposed actions on air quality. Air quality at Sandy Hook is highly influenced by the combined industrial, commercial, residential, and vehicle emissions of the New York/New Jersey metropolitan area. No changes to vehicle access or traffic patterns are considered under any of the alternatives, including the No Action Alternative. As a result, overall air quality would not be affected by any of the alternatives, since regional air quality conditions and traffic adjacent to the Park would presumably remain unchanged.

Water Quality

The Park completed in 1997 construction of a new treatment plant that purifies wastewater in accordance with standards administered by the New Jersey Department of Environmental Protection. Treated water currently is pumped to retention ponds located approximately one quarter mile east of Fort Hancock, where the water percolates into a perched, brackish, water table that lies approximately three feet below ground in the Fort Hancock area. None of the alternatives presented in this EA would affect the Park's wastewater treatment system or retention ponds.

Water in the surface aquifer generally flows west to east from Sandy Hook Bay to the Atlantic Ocean. None of the alternatives in this EA would impact surface run-off or otherwise affect water quality or salinity in Sandy Hook Bay. The potential creation of tidal pools or moist soil substrates as a habitat enhancement on oceanfront beaches as presented in Alternative C would have a negligible effect on the subsurface water table, as it would only expose it on the surface where the water table is already proximal to the beach surface and within yards of its presumed discharge into the ocean. Local and regional groundwater resources would not be affected since drinking water is pumped from contained aquifers hundreds of feet below the surface water table, such as the Farrington/Middle Potomac-Raritan-Magothy Aquifer at a depth of over 900 feet.

Floodplains

Executive Order (EO) 11988 (Floodplain Management) requires the NPS and other federal agencies to evaluate likely impacts of actions on floodplains. The 100 year floodplain includes all Parkland up to an elevation of 10.8 feet above mean sea level (MSL) (NPS 1994). None of the alternatives would elevate the areas above the floodplain or reduce the capacity and function of the floodplain. The action alternatives evaluated in this EA, which protect shoreside threatened and endangered species habitat and populations, are dependent upon the habitat being located in a floodplain.

II. ALTERNATIVES

This section describes the alternatives that were considered in the overall project analysis to meet the desired NPS objectives of providing adaptive management of sensitive shoreside natural resources while protecting other Park values and maintaining recreational access to the Park (Table 3). These alternatives were developed through a scoping process with interagency and public meetings as well as follow up discussion with the USFWS, NJDEP and NPS staff and public commenters for further clarification. Possible solutions considered in the initial scoping process with both agency and community representatives are listed below.

Certain alternatives were eliminated early in the analysis because they did not sufficiently meet project purpose and needs. Other alternatives, which offered maximum levels of resource protection, were screened out because they would adversely affect Park visitors and/or operations. Only those alternatives determined to have any potential for meeting the objectives of

Table 3. Summary of the Alternatives considered.

Alternative	Features
<p>A: Continue to Implement Existing Required Management Activities to Protect Federally-listed Species (No-Action)</p> <p><i>This alternative does not include New Jersey state-listed species nor any additional measures to improve the number, productivity or distribution of Special Status Species</i></p>	<p>Under the No Action Alternative, the Park would continue to implement all existing separate policies, programs, and updated guidance, including:</p> <ul style="list-style-type: none"> • <i>Management Plan for the Threatened Piping Plover</i> (NPS 1992) • <i>Osprey Management Plan</i> (NPS 2000) • Gateway NRA General Management Plan (NPS 1979, 1990) • <i>NPS Management Policies</i> (NPS 2001c, 2006) • NPS Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-making (NPS 2001a) • Northeastern Beach Tiger Beetle (<i>Cicindela dorsalis dorsalis</i> Say) Recovery Plan (USFWS 1994a) • Guidelines for managing recreational activities in piping plover breeding habitat (USFWS 1994c) • Biological Opinion for the reintroduction of the Northeastern beach tiger beetle (USFWS 1994b) • Piping plover (<i>Charadrius melodus</i>), Atlantic Coast population, revised recovery plan (USFWS 1996a) • Recovery Plan for seabeach amaranth (<i>Amaranthus pumilius</i>) Rafinesque (USFWS 1996b) • Guidelines for the Use of Predator Exclosures to Protect Piping Plover Nests (USFWS 1996c) • Roseate Tern <i>Sterna dougallii</i>, Northeastern Population Recovery Plan (USFWS 1998) • Biological Opinion for the 2002 Interim Beach Fill Project (USFWS 2002a) • Multiuse Pathway Project Biological Opinion (USFWS 2003a) • Biological Opinion for the proposed Sand Slurry Pipeline (USFWS 2005a)

Alternative	Features
<p>B: Shoreside Species of Concern Conservation Plan</p> <p><i>This alternative attempts to balance the Park's mission and requirements to protect threatened and endangered species while providing multiple uses and recreation opportunities</i></p>	<p>Under the Shoreside Species of Concern Conservation Plan Alternative, the Park would integrate all federal and state-listed shoreside species into one program that would:</p> <ul style="list-style-type: none"> • Implement all the provisions of the No Action Alternative • Enhance coordination of Park operations to improve public and employee education and enforcement of regulations relating to Special Status Species • Implement strategies to be used for minimizing human disturbance to Special Status Species as a result of recreational activities in existing protection areas of the Park • Increase predator management, including lethal control when necessary, on targeted predator populations to reduce losses of Special Status Species to an acceptable level
<p>C: Shoreside Community Protection Plan</p> <p><i>This alternative prioritizes threatened and endangered species and habitat protection by restricting other recreational uses</i></p>	<p>Under the Shoreside Community Protection Plan the Park would integrate all federal and state-listed shoreside species into one program that would:</p> <ul style="list-style-type: none"> • Implement all the provisions of the No Action Alternative • Modify Park operations to improve public and staff education, management, and enforcement of regulations relating to Special Status Species, including the reallocation of staff and resources • Restrict human disturbance to Special Status Species from recreational uses of the Park, including a new oceanfront closure area and possible bayside closures • Substantially increase predation management, including lethal control when necessary, to minimize losses to Special Status Species adults, young, eggs and nests caused by predation

providing adaptive management with actions to reduce predation losses and human disturbance of beach nesting birds, were considered for further evaluation.

Alternative A would continue to implement the existing suite of management activities for federally-listed species at Sandy Hook (No Action). Alternative B would implement a Shoreside Species of Concern Conservation Plan that would include all of the existing management activities of Alternative A, add state-listed shoreside species and other species of management concern, and would conserve and increase the productivity and numbers of beach nesting birds by: 1) reducing predation losses through a more active and integrated predation management program that includes lethal control when necessary, and 2) reducing human disturbance through improved management, education and enforcement. No new protection areas are proposed under Alternative B, but the habitat quality of the existing protection areas would improve. Alternative C, a Shoreside Community Protection Plan, would implement all of the management activities of Alternatives A and B, but would increase the protection of the entire shoreside ecosystem,

increasing species productivity, numbers and potentially distribution, by: 1) substantially reducing predator populations, including the use of lethal control when necessary, in the Park, and 2) increasing restrictions on recreational uses of the Park through an additional seasonal beach closure on the oceanside and investigating the need for new bayside closure areas. Both the habitat quality and the size of protection areas would increase with implementation of Alternative C but recreational opportunities would be diminished.

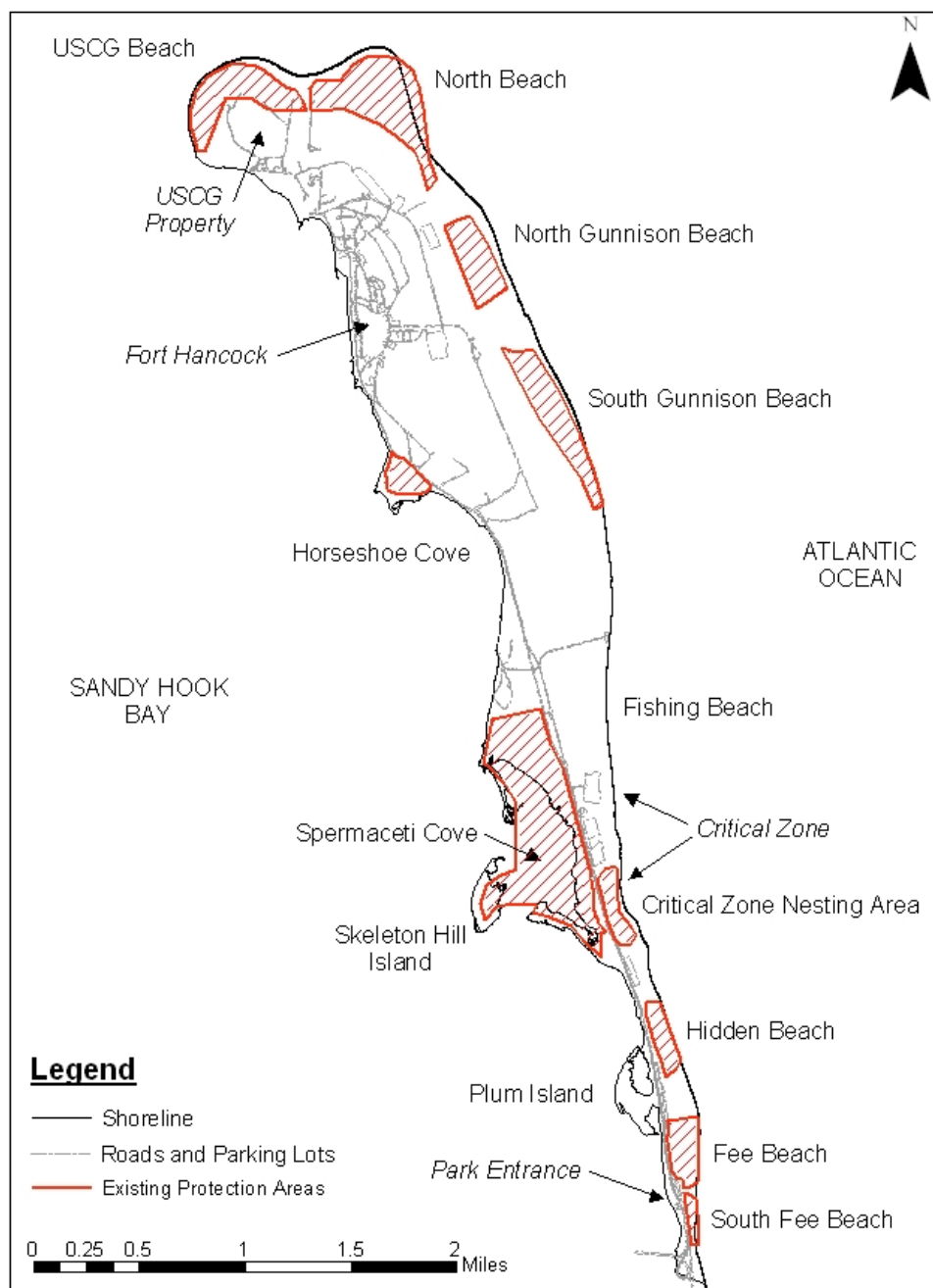
ALTERNATIVE A: CONTINUE TO IMPLEMENT EXISTING MANAGEMENT ACTIVITIES FOR FEDERALLY-LISTED SPECIES (NO-ACTION)

The No-Action Alternative would continue to implement the current suite of management activities for protected resources at Sandy Hook, including the 1992 *Management Plan for the Threatened Piping Plover*, the 2000 *Osprey Management Plan*, and the non-discretionary conservation measures, Reasonable and Prudent Measures, and Terms and Conditions of the four existing Biological Opinions with the USFWS (see the Glossary for definitions of these regulatory terms).

The USFWS Biological Opinion for the reintroduction of the Northeastern beach tiger beetle proscribed protection measures for that species (USFWS 1994b). The Biological Opinion for the 2002 Interim Beach Fill Project proscribed protection measures for the piping plover and seabeach amaranth (USFWS 2002a). The 2003 Multiuse Pathway Project Biological Opinion defines mandatory protection measures for piping plover (USFWS 2003a). And the Biological Opinion for the proposed Sand Slurry Pipeline details required protection measures for piping plover, seabeach amaranth and Northeastern beach tiger beetles (USFWS 2005a). Altogether, these four Biological Opinions and the 1992 *Management Plan for the Threatened Piping Plover* proscribe 131 management actions for the NPS to protect three federally-listed species found on the Park's shoreside areas. For a complete listing of the on-going actions, arranged by species, see Appendix A. Some of the actions relate to design and construction of Park projects, including the 2002 Interim Fill Project and the 2003 Multiuse Pathway Project, and have already been completed; these are listed in Appendix B. The proposed Sand Slurry Pipeline Project has a number of protection measures that would be implemented if and when that project is constructed; these measures, developed in consultation with the USFWS and NJDEP, are listed in Appendix C. All 131 of these actions – completed on-going or future – are included in the No Action Alternative as they are existing management activities of the NPS at Sandy Hook.

In addition to the management plans and Biological Opinion requirements described above, the NPS has incorporated several habitat-based protection measures into the management of shoreside Park resources (see Appendix D for a detailed listing). The Park uses seasonal protection areas that close some beaches to limit human disturbance to shorebird nesting areas (Fig. 1). Intensive human uses are generally allowed at Sandy Hook, but limited to the recreation zones. The Park conserves several non-oceanfront sensitive areas (Spermaceti and Horseshoe Coves, Holly Forest) by closing them to recreational use, or limiting access to ranger-led tours or educational groups by permit (Fig. 1). Public off-road vehicle use is prohibited year-round at Sandy Hook in order to minimize human disturbance to the shoreside beach communities (NPS 1992, USFWS 2005a).

Figure 1. The Sandy Hook Unit of Gateway NRA and the location of existing protection areas within the Park. The position of the shoreline changes often, and the protection areas shift accordingly; the shoreline at North Beach has shifted west since the protection area was mapped.



The Park has a program to remove invasive, non-native vegetation in areas managed for the protection of federally-listed species (USFWS 2005a). The NPS conducts a detailed biological monitoring program every year on several protected species as well as physical monitoring of the Gunnison Beach and Critical Zone areas. The existing predation management program at Sandy Hook includes measures to remove predator attractions such as trash cans, the use of predator exclosures on piping plover nests, and the trapping and relocation of mammalian predators.

The No Action Alternative is adaptive to changing regulatory requirements and policies of the USFWS, NJDEP and other regulatory agencies. Appendix D describes the existing, individual management activities and Park operations at Sandy Hook. The components of the No Action Alternative are subject to changes in state and federal regulations and policies, such as the removal of the Park's wildlife relocation permit for red fox in 2007 and the annual renewal of beach raking permit areas.

ALTERNATIVE B: SHORESIDE SPECIES OF CONCERN CONSERVATION PLAN

The Preferred Alternative (Alternative B) incorporates and builds upon the existing management activities of the Park, as summarized in the No Action Alternative and Appendices A through D. The proposed action is the implementation of a Shoreside Species of Concern Conservation Plan, as described below. The proposed Shoreside Species of Concern Conservation Plan updates the 1992 *Management Plan for the Threatened Piping Plover* with the latest scientific information and policy guidance for the piping plover; incorporates the Northeastern beach tiger beetle, seabeach amaranth, state-listed shoreside species, and other species of management priority as listed in Table 4; includes all non-discretionary requirements of existing Biological Opinions proposed to achieve or exceed USFWS piping plover recovery goals for productivity and population size, and to respond to the anticipated denial of a NJDEP wildlife relocation permit to trap and relocate red fox out of the Park (as stated in a February 16, 2006, letter from NJDEP to the Park). The proposed action contains new or modified management activities for which it is feasible to obtain any required state or federal permits as these activities were selected to be consistent with current state and federal policies and regulations. The Preferred Alternative does not significantly increase the Park's operational or staff costs, and it is therefore feasible to fund implementation.

The Preferred Alternative reflects an attempt to balance the multiple use aspects of the Park and its mission. It proposes to improve conservation of threatened and endangered species through enhanced monitoring and enforcement of existing, designated protected areas and directly addresses key factors limiting their recovery (human disturbance and predation). These conservation enhancements would be in addition to the ones listed under the No Action Alternative and would include:

- New Jersey state-listed species and other species of management concern and measures that may be used to aid in their recovery
- Enhanced coordination of Park operations to improve public and employee education and enforcement of regulations relating to Special Status Species
- Strategies to be used for minimizing human disturbance to Special Status Species as a result of recreational activities in the Park

- Use of integrated predator management to reduce losses of Special Status Species to an acceptable level and increase their productivity

The proposed Shoreside Species of Concern Conservation Plan specifies management goals and performance indicators for each of the Special Status Species, activities to reduce impacts to natural resources from human disturbance, an updated Integrated Predation Management Program, habitat enhancement opportunities, and an updated biological monitoring program. Conservation recommendations that have been made by the USFWS and NJDEP have been incorporated where possible and feasible. The proposed Shoreside Species of Concern Conservation Plan is adaptive to changing conditions and threats to Special Status Species, and regular reviews and updates of the plan would be conducted by the NPS in consultation with the USFWS and NJDEP.

Table 4. Special Status Species included in the proposed Shoreside Species of Concern Conservation Plan. Scientific names are listed in parentheses. Species noted with an underline are those with existing management activities as described under Alternative A (No Action).

Birds	Plants	Other Animals
American bittern (<i>Botaurus lentiginos</i>)	<u>Seabeach amaranth</u> (<i>Amaranthus pumilus</i>)	<u>Northeastern beach tiger beetle</u> (<i>Cincindela dorsalis dorsalis</i>)
Red knot (<i>Calidris canutus rufa</i>)	Sea-milkwort (<i>Glaux maritime</i>)	Horseshoe crab (<i>Limulus polyphemus</i>)
<u>Piping plover</u> (<i>Charadrius melodus</i>)	Seabeach evening primrose (<i>Oenothera humifusa</i>)	Northern diamondback terrapin (<i>Malaclemys terrapin terrapin</i>)
American oystercatcher (<i>Haematopus palliatus</i>)	Seabeach knotweed (<i>Polygonum laucum</i>)	
Bald eagle (<i>Haliaeetus leucocephalus</i>)		
Black rail (<i>Laterallus jamaicensis</i>)		
Black-crowned night heron (<i>Nycticorax nycticorax</i>)		
Yellow-crowned night heron (<i>Nyctanassa violacea</i>)		
<u>Osprey</u> (<i>Pandion haliaetus</i>)		
Black skimmer (<i>Rynchops niger</i>)		
Least tern (<i>Sterna antillarum</i>)		
Roseate tern (<i>Sterna dougallii</i>)		
Common tern (<i>Sterna hirundo</i>)		

Management Goals

The NPS recognizes the management goals and objectives of existing management and conservation plans, including individual species recovery plans, to manage for a healthy and diverse shoreside ecosystem while providing diverse and disperse recreational opportunities for Park visitors. The Park would closely coordinate with the NJDEP and USFWS in the implementation of these recovery and conservation plans as they pertain to Sandy Hook. For more detailed management goals and performance indicators for each of the Special Status Species, see Appendix E.

New or Expanded Conservation Measures

Most of the existing conservation measures described in the No Action Alternative for individual species benefit other plant and wildlife species on the Park's shores, as they share the same or similar habitats (Watts 1999). In reviewing the status and threats to shoreside threatened and endangered species in the Park for the proposed action, additional protection measures were identified by NPS staff, federal and state partner agencies, stakeholders, and the public. The Park would adaptively manage the beach community as an interconnected ecosystem (NPS 2001a), adding these new or expanded conservation measures to benefit the entire beachfront ecological community.

Human Disturbance

Human disturbance is the second most significant threat currently facing threatened and endangered shoreside species in the Park. While the majority of human disturbance activities are limited to the recreational use zones (the public beaches), occasionally human disturbance issues may threaten species that are sensitive to disturbance. Northeastern beach tiger beetles are so sensitive to human disturbance, for example, that Hill and Knisley (1994) recommend prohibiting all but emergency ORV use from tiger beetle areas and limiting human use to less than 50 people per week during the summer and fall, and then only as walkers along the water's edge. The NPS would better manage official vehicle ORV use to minimize disturbance, including limiting law enforcement trips in protected areas to true emergencies and staying in existing tracks in bird nesting and Northeastern beach tiger beetle protected areas. The causes for the declines in reintroduced populations of Northeastern beach tiger beetle at Sandy Hook are unknown; if human disturbance is identified as a significant threat, adaptive management measures may be developed, including appropriate measures to minimize human disturbance to the protection zone around the tiger beetle area at North Beach.

The NPS currently provides multiple layers of protection to beach nesting birds at Sandy Hook. Piping plovers and other beach nesting birds are provided two layers of protection from human disturbance; the entire bird nesting area within each protection zone is roped off with symbolic fencing (posts spaced 50 ft apart with signs (Fig. 2), connected by a string of rope), plus a second set of heavier line fencing and signage perpendicular to the beach at the boundaries between the protection zone and recreational beach and to close intertidal zones adjacent to nests when the chicks have hatched but not fledged. The Park also has placed larger signs informing people of the beach nesting birds, their protection under the Endangered Species Act, and the seasonal

beach closures to pets and certain human activities (Fig. 3). To meet the goals of the proposed action to increase productivity of beach nesting species other than piping plover, the Park would expand the protective fencing and signage program to include buffers around least tern, American oystercatcher, and other beach nesting birds as they occur. The biological monitoring program would allow for the adaptive management of the signs, posts and fencing to prevent, to the extent possible, perching by avian predators in bird nesting areas.

In addition, kites (including kiteboarding or kite surfing) are currently prohibited within 500 feet of shorebird nesting areas as outlined in the 1992 *Management Plan for the Threatened Piping*

Figure 2. Bird nesting areas are protected from human disturbance by symbolic rope fencing with posts and signs posted every 50 ft (15 m). Photo by Terwilliger Consulting, Inc., June 27, 2006.



Figure 3. The Park uses larger educational signs such as this one to inform visitors of the beach nesting birds, their protection under the Endangered Species Act, and the seasonal beach closures to pets and certain human activities. Photo by Terwilliger Consulting, Inc., June 27, 2006.



Plover (Table 2; NPS 1992). The USFWS has since issued guidance on recreational activities in piping plover nesting areas, and recommends prohibiting kites within 650 ft (200 m) of piping plovers between April 1 and August 31 (USFWS 1994c). Accordingly, the Park would expand the oceanfront areas closed to kites and kite surfing to include all beach nesting birds and to extend 650 feet from shorebird nesting areas.

If a piping plover or other bird nest is established near the edge or outside of the fenced areas, the closure would be adjusted to provide a buffer of at least 50 yards in each direction (as recommended by USFWS 1992) or to the extent possible in recreational beach areas. Nesting birds would be monitored regularly to assure that incubating birds are not flushed from the nest by passing pedestrians and nearby sunbathers. If such disturbance is occurring, adaptive management measures may include expanded closures or other appropriate actions to minimize human disturbance.

Jenkins and Pover (2003) recommend an increase in Park resources to reduce human disturbance within beach closure areas, from off-leash pets, and littering. The Park has already increased public outreach by keeping the Park's "No Pets on Beach" signs up year-round to educate the

public that there are no dogs allowed on the oceanfront beaches between March 15 and Labor Day. An increase in enforcement (as funding allows) of existing protection measures could also reduce human disturbance (Jenkins and Pover 2003). The NPS has implemented these recommendations to the extent possible. The Park would maintain recommended reductions in official NPS vehicle use of the beach after nests hatch and maintain cattle fencing between the multiuse path and shorebird nesting areas. The Park would also increase interpretive and education efforts to inform visitors, lifeguards, NPS staff, volunteers and others about the value of Sandy Hook for shoreside threatened and endangered species and why the protected areas are created and maintained. Up-to-date information on nesting areas and species would be regularly provided to lifeguards and NPS staff to improve staff coordination and public dissemination of the information. In addition, Natural Resources staff would increase their presence and monitoring at the interface between the protected and public beaches as much as possible to reduce human disturbance from people ignoring the fencing.

Full enforcement of existing protection measures at North Beach and other locations where human disturbance still threatens nesting birds in protection areas has been identified as a management need during the scoping process, and the Park would increase manpower to fully enforce existing protection measures in those areas to the extent that funding allows.

The increase in using the Park's bayside habitats such as those in and near Plum Island and Spermaceti Cove for recreational activities like kite surfing has been observed to flush all shorebirds in the vicinity (S. Barnes, NJ Audubon, and J. McArthur-Heuser, NPS, personal communications). Unrestricted human and pet use of New Jersey bayside habitats may also lead to disturbance of Northern diamondback terrapin nests and spawning horseshoe crabs. Clark and Niles (2000) have identified the protection of these bayside habitats from human disturbance as a conservation measure of highest priority for the North Atlantic region. In order to protect bayside species, the Park has closed Spermaceti Cove and the salt marsh and tidal creeks at Horseshoe Cove to recreational use. The Park would fully enforce existing restrictions on recreational use at Spermaceti and Horseshoe Coves to protect habitat for Northern diamondback terrapin, horseshoe crabs and red knot.

The Park would also improve identification of the Spermaceti Cove protection zone in Park informational media such as maps and brochures to better educate visitors. The NPS would repair and install new closure signs around Spermaceti Cove where needed to improve identification of the closure area. Regulatory buoys would be installed at the south waterborne entrance to Spermaceti Cove. Educational signs would be installed at Plum Island that identify which Special Status Species are using the area and that explain ways to voluntarily reduce recreational impacts (e.g., keeping pets on leashes, staying out of marsh grass, not harming spawning horseshoe crabs or nesting turtles). Prior to the start of the busy summer recreation season, the public would be notified of bayside area closures (i.e., Spermaceti and Horseshoe Coves) and recreational use limitations within the one-quarter mile jurisdictional boundary through press releases, brochures, Notice to Mariners, and other appropriate methods. Existing restrictions to be highlighted include no overnight use of Park lands for boaters, prohibition of personal watercraft, keeping pets on leashes, no fires, no camping, and no shellfishing.

As part of the Fort Hancock Rehabilitation Project, three historic osprey nesting sites at Buildings 13, 14 and 114 would be removed; NJDEP-recommended mitigation for this loss of nesting sites has already taken place through the construction of two new nesting platforms at North Pond and Old Trailer Park and the repair of four platforms along the interior of the Park south of Atlantic Drive and in the marsh north of Spermaceti Cove (NPS 2000, 2003a). In addition, the Park would evaluate the possibility of placing USFWS-recommended exclusionary devices atop the chimneys to discourage osprey from rebuilding their nests at those locations. The Park also would evaluate whether human disturbance threatens other existing osprey nesting sites, such as the South Maintenance site (an NPS maintenance yard), and take protective measures as needed to minimize or eliminate these threats.

North Pond has provided a valuable migratory staging site for shorebirds and waterbirds, with large groups of birds observed there during the migration periods. The Park would encourage continued and additional research to evaluate whether human disturbance is a threat to migratory shorebirds and waterbirds staging at North Pond, and if human disturbance poses a significant threat, adaptive management measures may be identified to minimize the threat of recreational use of the area around North Pond.

Finally, seabeach amaranth is currently protected by locating new dune crossovers and NPS patrol routes away from known seabeach amaranth locations. Plants are also afforded protection from the shorebird nesting area fencing, which limit ORV and human disturbance. If plants are located in areas where they are likely to be damaged, the NPS installs string fencing around individual plants or groups of plants to minimize disturbance. The Park would expand these protection measures to include documented locations of seabeach knotweed and seabeach evening primrose, both of which are perennials and would persist in the same location for several years. Installation of sand fencing and dense planting of vegetation, especially non-native species such as Asian sand sedge, would be prohibited within suitable and known seabeach amaranth habitat, as recommended by USFWS (2002a, 2005a). The USFWS (2005a) also recommends prohibiting mechanical beach raking, sand scraping and ORV use in areas within 33 feet (10 m) of any documented seabeach amaranth plants, which may occur in the recreational use zones where beach grooming activities are normally permitted; the NPS would implement this conservation measure. Finally, the Park would evaluate opportunities to implement a program of long-term storage of seabeach amaranth seeds collected from various parts of Sandy Hook as insurance against catastrophic population declines (as recommended by USFWS 2002a).

Integrated Predation Management

Predation appears to be the dominant threat to beach nesting birds at Sandy Hook, suspected as the cause for the zero productivity of least terns, common terns and American oystercatchers in recent years. Increased predation on piping plover nests, typically by smart fox (Table F-3) has contributed to a 63% decline in productivity from 1999 to 2004. Jenkins and Pover (2003) and USFWS (2005a) have both recognized the need to modify the predation management program at the Park to better protect beach nesting birds from current or future predator species.

Excessive trash left behind by visitors may attract predators like fox, gulls and crows; the NPS has a carry-in, carry-out policy to avoid having trash cans or dumpsters attract predators to beach areas. The Park would evaluate a variety of options to enhance trash management, including more education for visitors on the carry-in, carry-out policy and an afternoon or evening pick-up of litter.

Predation is not a problem at Sandy Hook alone, but also impacts beach nesting birds throughout New Jersey (Jenkins and Pover 2003, 2004b) and the Northeast (Clark and Niles 2000). In 2005, a partnership of federal and state agencies, and conservation organizations was formed to devise a strategy to address predation management on beach nesting birds in New Jersey. This partnership, of which the NPS is a member, is reviewing the scientific literature on predation in beach nesting bird communities and developing a set of best management practices for predation management for use by local communities and other large landowners. The Virginia barrier islands are also facing predation threats (Erwin *et al.* 2001), and they recently developed a predation management strategy to minimize predation losses (USDA 2005). USDA (2005) summarizes the scientific knowledge on predation and predator control in beach nesting bird communities, which is incorporated herein by reference.

The current predation management program at Sandy Hook has not been effective in maintaining piping plover losses at levels needed to ensure recovery (as measured by losses of nesting attempts or of hatched chicks to predator activity), even though the Park implemented the use of electrified exclosures in 2004 and the trapping and relocation of red fox in 1998, 1999, 2005 and 2006. Under Alternative B, predation management would be more proactive in the identification and reduction of unnaturally high predator populations. Predation management would target the loss of adults, chicks / young, and eggs of all Special Status Species, as well as predator-induced abandonment of nests. In order to reduce predation losses to acceptable levels, the Park has identified a suite of predation management approaches, which integrate a variety of “tools” into a “toolbox” from which the Park may choose the best method of addressing site-specific predation threats as conditions and predators change over time. The dominant predator on beach nesting birds at present is red fox, but other species such as crows, gulls, skunk, or cats may become more problematic in the future. The proposed Integrated Predation Management Program is adaptive in nature, allowing the NPS to use whichever predation control methods are most appropriate for whatever predator species (mammalian or avian) is causing unacceptable losses to Special Status Species.

If predation of eggs, young or adult piping plovers is detected, the Park may initiate the use of nest exclosures as per the USFWS guidelines (USFWS 1996c), but exclosures have limited value as they have limited utility against some predator species and do not protect other beach nesting birds, mobile piping plover chicks or adults. The Park would identify and remove any supplemental food sources for predators, such as trash and fish offal. Electrified exclosures, electric boundary fences, and/or other methods of aversive conditioning may be used as a predator deterrent as appropriate. Humane trapping and relocation of predators, to the extent that it is consistent with the state’s wildlife relocation policy and is permitted by NJDEP, may be used to reduce predator populations near areas supporting Special Status Species.

Individual predator animals that are identified as problem individuals would be trapped and relocated at any time of year, as consistent with the state's relocation policy. Where relocation is not permitted, the problem individuals (e.g., red fox) would be controlled with one or more of the following methods:

- Allow trapping as authorized by law, if the predator is a NJ game species
- Hire a contract trapper to control the predator population with lethal means
- Use the U.S. Department of Agriculture, Animal & Plant Inspection Service, Wildlife Services, to control the predator population with lethal means
- Use authorized Park personnel to control the predator population through humane live capture followed by euthanasia (killing) of individual predators, consistent with methods developed by the USDA (2003, 2004, 2005)

Reductions in the predator population(s) would be conducted using approved non-lethal and lethal techniques for wildlife damage management of mammals as described and evaluated in USDA (2004) and of birds in USDA (2003), and specifically for the protection of beach nesting birds as described and evaluated in USDA (2005). In years where piping plover productivity is below the recovery goal of 1.5 chicks per nesting pair, and fox are identified as the primary cause of predation losses, the NPS would proactively control the fox population during the non-nesting season, using one or more of the methods listed above. Fox dens would be identified and controlled near the Park's oceanfront protection areas. Fox dens located east, or on the ocean side, of Hartshorne and Atlantic Drives, and within 1,000 meters of existing oceanfront protection areas, would be targeted for population control, including the use of lethal control when necessary. Pending clearance from the U.S. Coast Guard (USCG), these buffers would include management of fox dens on those portions of the USCG property within 1,000 meters of the northern protection areas. The Park would monitor the effectiveness of any fox den buffer zones near the oceanfront protection areas and would adaptively manage their location and size depending on their observed effectiveness at reducing fox predation losses to beach nesting birds.

The goal of this Integrated Predation Management Program is to control the predation threat on beach nesting birds and increase their productivity. As new predator species or issues are identified (e.g., grackles recently have been observed by NPS staff to be harassing incubating piping plovers), this management program would allow Park staff to adapt to those changing conditions, using whichever "tool" is best from the above "toolbox."

Habitat Restoration and Enhancement

According to NPS management policies, habitat manipulation is not the preferred method for endangered species management. Other management methods such as visitor use restrictions are tried before actively manipulating protected species habitat. In some instances, such as if all other management methods have not achieved management goals, habitat restoration may be appropriate to restore habitat that would be expected to exist if the habitat had not been altered in some way by human activities.

Sandy Hook is one of the few relatively undeveloped areas of shoreside habitat in New Jersey, and as such has the opportunity to be proactive stewards of threatened and endangered species

and their habitat. Bayside habitat is very valuable to foraging and roosting shorebirds and waterbirds, as well as nesting habitat for birds such as osprey, American bittern, black rail, the Northern diamondback terrapin and horseshoe crab. These habitats are currently limited in the Park, with 65% of the bayside shoreline stabilized with hard structures such as riprap and bulkheads.

The New Jersey Wildlife Action Plan calls for the identification, protection, enhancement and/or restoration of estuarine habitat in Raritan Bay and the North Atlantic Coast (of NJ) for species of conservation concern such as osprey, least tern, bald eagle, and night-herons (NJDEP 2005). The NPS would evaluate the potential restoration of valuable bayside habitats at Sandy Hook to enhance habitat for Special Status Species. The existing shoreline stabilization structures are important to protect the cultural and historic resources of the Park. Some of the shoreline stabilization structures are no longer functioning as designed, however, and pose a public safety hazard (e.g., bulkheads around the Chapel and ferry dock). Non-functioning shoreline stabilization structures degrade the bayside environment, and the Park would evaluate whether non-historically significant structures can safely be removed or reconstructed landward of the estuarine sandy beach in order to enhance bayside habitat. Replacing bulkheads with offshore breakwaters may be another option to protect bayside shorelines while providing protection from boat wakes and erosive wave action.

The Park would investigate ways to improve degraded bayside habitat near the Kingman and Mills batteries, and implement habitat restoration as funds become available. The use of soft shoreline stabilization techniques such as beach nourishment would be promoted to protect historic structures or important infrastructure rather than hard structures such as stone rip rap or bulkheads that limit the use of bayside habitats by Special Status Species.

The Park would also evaluate the option of conducting beach nourishment projects (utilizing the future sand slurry pipeline) on the bayside to cover riprap structures with clean, compatible sand as a means to restore sandy estuarine habitat for Northeastern beach tiger beetles, horseshoe crabs, Northern diamondback terrapin, and foraging shorebirds and waterbirds. Horseshoe Cove may provide such opportunities for habitat enhancement or restoration. If sandy beach habitats of fine-grained sand can be identified, enhanced and restored, Hill and Knisley (1994) recommend a beach length of at least 1,312 ft (400 m) and a dry beach width of at least 6 – 26 ft (5 to 8 m) to provide suitable habitat for Northeastern beach tiger beetles. Potential opportunities to restore salt marsh habitat along the bayside would also be investigated, possibly in partnership with the U.S. Army Corps of Engineers or other partners, to restore habitat for Northern diamondback terrapin, black rail, American bittern and other waterbirds. The removal of the invasive *Phragmites* from bayside habitats has been identified as a regional priority conservation measure by Clark and Niles (2000), and provides another method to restore shoreside habitat at the Park; the NPS would evaluate the abundance and distribution of *Phragmites* and initiate removal or control projects in key areas as appropriate.

The NPS would evaluate the current status of sandy beach and intertidal mudflat habitat at Plum Island, implementing additional protection measures for spawning horseshoe crabs and foraging red knot as adaptive management measures are identified (Clark and Niles 2000). Opportunities

to partner with the NJDEP Osprey Project to enhance osprey habitat through the erection of additional artificial nesting platforms within the Park would be investigated.

On the oceanside, the Park would evaluate the potential to further the restoration of seabeach amaranth habitat in New Jersey by propagating the species into suitable habitats not currently supporting large populations (e.g., North Beach, Coast Guard Beach) through the collection and dispersal of seeds from existing plants within the Park. As recommended by USFWS (2002a) and NJDEP (2005), current management actions to control the encroachment of non-native, invasive species into productive beach nesting and seabeach amaranth habitat would be maintained. The USACE (Philadelphia District) and NJDEP are developing statewide dune management guidelines that incorporate the needs of threatened and endangered species (USFWS 2005b), and once developed the NPS would adaptively manage the dunes (as needed) in the Park consistent with those guidelines.

Lastly, the USFWS (2002a) recognized the opportunity to restore natural habitat features in the beach fill of the Critical Zone. The USFWS recommends a NPS partnership with the USACE and USFWS to maximize habitat suitability in the Critical Zone beach fill, possibly restoring natural features such as gradual beach slopes (on the dry beach) and non-ocean feeding areas like tidal pools. If habitat restoration becomes necessary to improve the status of Special Status Species at Sandy Hook, the Park would investigate opportunities at the Critical Zone as funding allows, in coordination with the USFWS and USACE.

Biological Monitoring

The Park currently monitors the three federally-listed species within the Park and monitors osprey, least tern, and American oystercatcher nests as funding and personnel resources allow. In order to meet the management goals and measure the performance indicators outlined in Appendix E, the Park would increase the level of biological monitoring (as funding allows) to fully monitor osprey, least tern, and American oystercatcher nests and productivity, and the nests and productivity of black skimmer, common tern, black rail and black-crowned night heron as they are observed, and consistent with NJDEP (2005). The NPS would coordinate with USFWS and NJDEP to determine if the Park's current monitoring protocols are adequate to determine the causes of loss of these additional species; protocols for monitoring food supplies (invertebrates, etc.), for example, might identify food supplies as a limiting factor that needs to be addressed in order to improve productivity. The Park would continue to band young osprey in partnership with the NJDEP Osprey Project, and as recommended by Jenkins and Pover (2003), continue to monitor bayside habitats for foraging adult shorebirds and waterbirds.

The current biological monitoring and reporting requirements (Appendix A) often are redundant and inefficient for NPS staff to implement. The NPS would coordinate with the USFWS and NJDEP to consolidate the monitoring and reporting needs of the Park into an efficient system that eliminates redundancies, potentially merging all of the needed reports into one annual reporting document.

The NPS would continue to monitor predator species and populations at Sandy Hook, which would allow staff to measure the effectiveness of the Integrated Predation Management Program

and adaptively manage for changing conditions in the particular species and losses attributable to predators over time. For example, monitoring would include observations of avian predators that perch on signs, posts, fences, etc., and target Special Status Species; if this behavior is associated with predation of Special Status Species, adaptive management measures may include design modifications to signs (to eliminate available perches), changes in the location of signs or fences further away from nesting areas, or the lethal removal of perching (predator) birds.

The Park would initiate surveys during the migration seasons to determine the abundance and distribution of migrating piping plovers, red knots and other migratory species of importance, again consistent with NJDEP (2005). The USFWS (2002a) recommends that the Park conduct research to determine where pre-nesting and non-incubating piping plover adults forage and stage on southern Sandy Hook throughout the nesting season, starting in mid-March. Such a study would involve using two observers with phones or radios to locate birds and observe their movements. The NPS would conduct this research as funding allows. Protection of identified piping plover habitats and migratory staging, roosting and foraging areas would be implemented as appropriate as threats are identified, such as extending the seasonal windows on beach closures.

The NPS would develop a system to improve tracking and management of the number of school and environmental education groups that use the bayside areas. Monitoring efforts would be improved to determine the current use of the bayside by Special Status Species, and those uses would be compared with weather conditions, visitation, the types of recreational activities present, and the habitat type. The NPS would continue to investigate the authority and jurisdiction of the Park as it relates to the one-quarter mile jurisdiction from the shoreline. The state of New Jersey owns lands below the high water mark, but the Park's legislated boundary extends one-quarter mile from the low tide mark.

The NPS would encourage continued and additional research into all aspects of Special Status Species habitat. For example, the Park would work with USFWS and NJDEP to identify causes of the failure of reintroduced Northeastern beach tiger beetles to achieve a self-sustaining population. Annual population surveys would be conducted from the third week in June through the end of July to determine peak adult counts, during appropriate weather conditions; multiple surveys may be necessary to fully evaluate the abundance of Northeastern beach tiger beetles within the Park. Suitable bayside habitats would be identified for potential alternative or supplemental reintroduction sites, and possible reintroduction to those sites would be coordinated with the USFWS. Reintroductions would be supported by the Park until a self-sustaining population of at least 500 individuals is achieved.

Finally, the NPS would monitor the effectiveness of any conservation measures implemented to offset losses of seabeach amaranth. In particular, if implemented, the NPS would monitor the effectiveness of transplantation, seed collection and re-seeding, as recommended by USFWS (2005a). Seabeach amaranth populations would be monitored for evidence of herbivory, both mammalian and insect, identifying herbivores where possible and reporting monitoring results to the USFWS (as recommended in USFWS 2002a).

Plan Updates

In order for this plan to be adaptive to changing conditions, the NPS would regularly review the status of shoreside threatened and endangered species at Sandy Hook and revise conservation measures as needed. The monitoring and management program would be evaluated at least biannually, and, with USFWS and ENSP input, the program and program staffing would be adapted as needed to minimize disturbance from recreational and NPS activities occurring at Sandy Hook (USFWS 2005a). As species distributions and / or threats may change, different levels and / or methods of species management may be necessary to maintain sufficient levels of protection. As recommended by USFWS (2005a), the review of species status and conservation measures would be conducted at least every 5 years, and any adaptation of the conservation measures would be coordinated with the USFWS and ENSP.

ALTERNATIVE C: SHORESIDE COMMUNITY PROTECTION PLAN

Alternative C incorporates and builds upon the existing management activities of the Park, as summarized in the No Action Alternative. This alternative incorporates all of the conservation measures and enhancements included in the Preferred Alternative (Alternative B), but implements a Shoreside Community Protection Plan that aggressively manages human disturbance and predation as limiting factors to Special Status Species by expanding Protection Zones and restricting access to additional northern beaches. The Park would reallocate staff and resources to improve public and employee education and enforcement of regulations relating to Special Status Species, and to implement management actions to eliminate limiting factors such as predation.

This Alternative reflects an attempt to aggressively manage the Park's shoreside natural community for Special Status Species by protecting additional shoreline habitats for nesting, foraging, roosting and migration of shorebirds and waterbirds. Additional protection to highly productive northern beaches would be provided by closing the Fishing Trail Access area at the north end of the Park to recreational use (Fig. 4). Access to Fisherman's Trail therefore would be restricted during the nesting season and to the intertidal zone from first-hatched chick to last-fledged chick (consistent with other protected areas). These measures would reduce the size of oceanfront swimming and fishing areas available to Park visitors by approximately 4%. Human disturbance to the oceanside would thus be minimized by restricting recreational use.

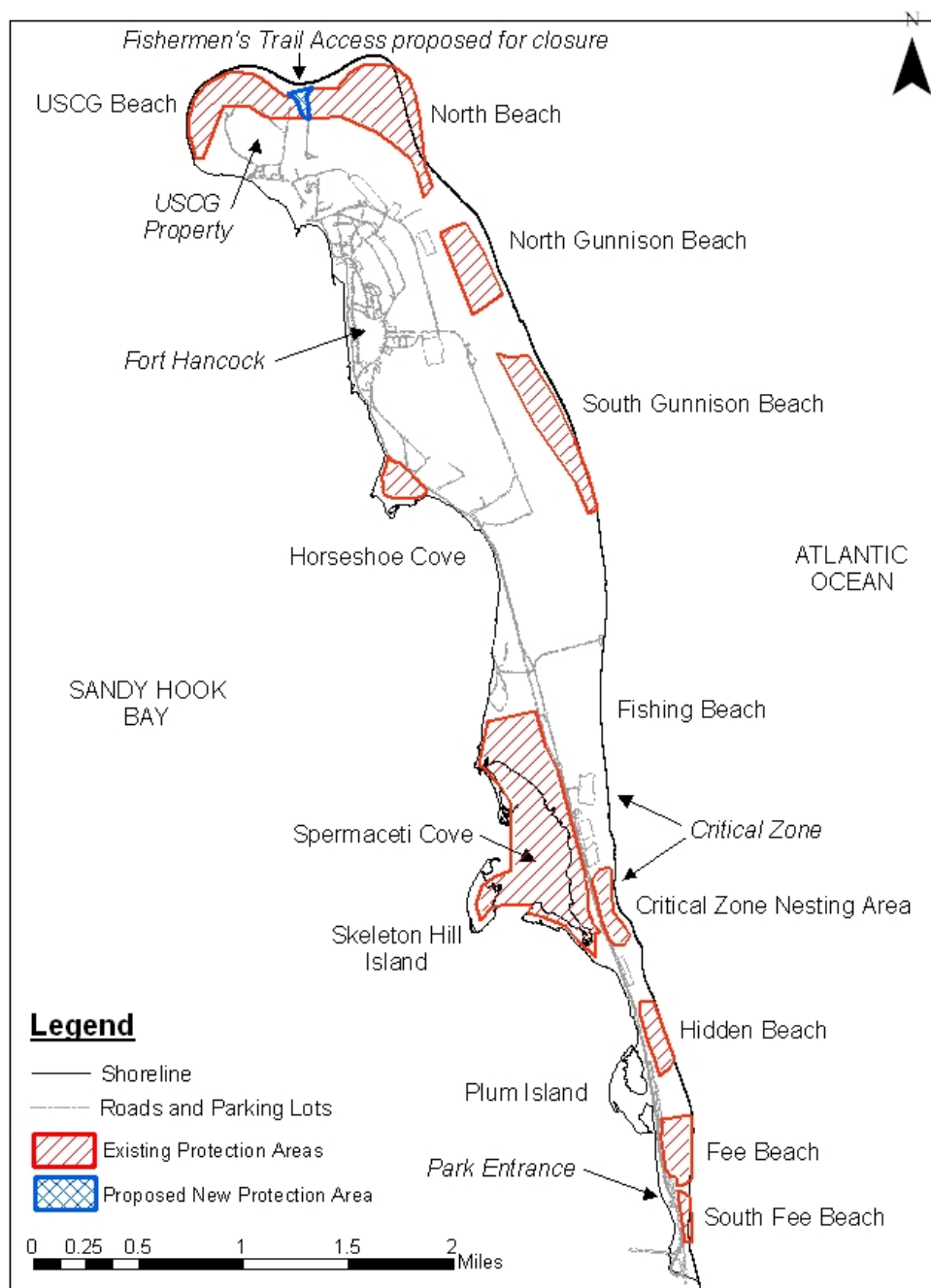
The NPS would survey the use of Sandy Hook's bayside areas by Special Status Species, including migratory and overwintering use, to evaluate whether new bayside protection areas with seasonal closures would be warranted in the future. If survey data indicate that human disturbance is a significant threat to Special Status Species using the Park's bayside habitats, the Park could adaptively manage these areas by closing particular areas to human (and dog) use from March 15 to Labor Day, including the prohibition of kite surfing, swimming, sunbathing, walking, fishing, crabbing, the beaching of boats, boating, scuba diving, and all other recreational activities. Possible closures of bayside habitats to the netting of baitfish and commercial clamming are additional methods the Park could use, if needed, to reduce the

impacts of human disturbance to the shoreside community and human predation on waterbird food sources.

The Integrated Predation Management program described in Alternative B (the Preferred Alternative) would be aggressively applied to further minimize predator populations at Sandy Hook, rather than waiting for predation losses to reach a threshold value (e.g., piping plover productivity of 1.5 in the previous year) and then reducing problem populations to acceptable levels. Known predators (e.g., red fox, raccoon, opossum, crows, gulls) would be removed through the most cost-effective means (both lethal and non-lethal). The fox den buffer zones proposed in Alternative B would be established and expanded to include the entire park.

Alternative C meets the purpose and need of the proposed action by aggressively managing the Park for protection of Special Status Species. The Shoreside Community Protection Plan would include all of the monitoring, adaptive updates, and habitat enhancement options of Alternative B (the Preferred Alternative). Management actions would be taken proactively to limit potential problems and threats rather than reactively as problems are documented. The protection of the Park's shoreside natural resources would be expanded beyond the restrictions contained in the No Action Alternative or proposed by Alternative B.

Figure 4. Alternative C proposes to close the the Fishing Trail Access area at the north end of the Park to recreational use from March 15 through Labor Day.



MITIGATION MEASURES OF THE ACTION ALTERNATIVES

Mitigation measures and development constraints are specific actions that when implemented, minimize, avoid, or eliminate impacts on resources that would be affected by alternative actions. The NPS would fully comply with all applicable laws, regulations, and policies governing resource protection including the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and agency specific guidelines.

No major adverse impacts to natural resources are anticipated from Alternative B, and therefore no mitigation measures are necessary. Implementation of a Shoreside Species of Concern Conservation Plan would improve the status and distribution of shoreside natural resources at Sandy Hook substantially.

Alternative C, a Shoreside Community Protection Plan, is not anticipated to result in any major adverse impacts to natural resources; as a result, no mitigation measures are necessary. The natural resources of Sandy Hook would receive increased protection if Alternative C was implemented with a major reduction in human disturbance and predation.

ALTERNATIVES CONSIDERED BUT DISMISSED

All of the following actions were initially considered as potential solutions for updating the Park's management of shoreside threatened and endangered species. However, each was later dismissed from further analysis due to a failure to meet the purpose, needs and/or objectives of the proposed action, or for unacceptable impacts on Park resources, visitor use, and NPS operations. A summary of all alternatives, both considered and rejected can be found in Table 5.

ALTERNATIVE D: Update the 1992 Piping Plover plan for the piping plover only.

This option was eliminated from further development because it does not address the Park's management needs and responsibilities for the Northeastern beach tiger beetle (which was reintroduced to the Park in 1994) or seabeach amaranth (which reappeared in 2000), nor for state-listed shoreside species. The Park's management activities would continue in a disjointed and inefficient fashion that does not consolidate the non-discretionary requirements of four USFWS Biological Opinions into one comprehensive location and adaptive system. This alternative does not meet the purpose and needs of the proposed action.

ALTERNATIVE E: Develop individual management plans for each threatened and endangered species.

The development of individual management plans for each shoreside threatened and endangered species at Sandy Hook would create twenty or more separate documents, which would be impractical to implement, redundant for species sharing the same habitat and similar life history requirements, and a waste of taxpayer dollars. Thus this option was rejected as impractical, inefficient and not cost effective.

ALTERNATIVE F: Update the 1992 Piping Plover Plan and develop a Shoreside Threatened and Endangered Species Management Plan that manages all Park shoreside beaches to eliminate (to the extent possible) all human disturbance and predation as limiting factors to threatened and endangered populations in the Park.

This alternative does meet the purpose and needs of the proposed action, but would have an unacceptable impact on Park operations. Visitation to Sandy Hook is very high (approximately 2.5 million visitors annually), but recreational use of the Park would be highly restricted under this option, which would eliminate human disturbance through the closure of larger beach areas for longer periods of time. Recreational opportunities would be significantly reduced. Law enforcement would correspondingly increase to enforce these new restrictions, necessitating a significant increase in Park operations funding or a diversion of resources from other projects and operations. In order to fully eliminate, to the extent possible, predation as a limiting factor on shoreside threatened and endangered species, Park staff would have to spend an inordinate amount of time tracking, trapping and killing every predator on the peninsula. If new staff were not hired to implement this option, Park operations would be significantly compromised and redirected away from other worthy Park management activities. Therefore this option was rejected for further consideration due to its unacceptable impacts to visitor use, Park resources and operations.

Table 5. Summary of the alternatives considered or rejected, and the reason for rejecting those that were dismissed from further review.

Alternative	Considered or Rejected	Reason for Rejection
Alternative A: No Action	Considered	N/A
Alternative B: Shoreside Species of Concern Conservation Plan	Considered	N/A
Alternative C: Aggressive Shoreside Community Conservation Plan	Considered	N/A
Alternative D: Update the 1992 Piping Plover plan only	Rejected	Does not meet NPS mission, purpose and needs; inefficient
Alternative E: Develop individual management plans for each species	Rejected	Impractical, inefficient, and not cost effective
Alternative F: Eliminate (to the extent possible) all human disturbance and predation as limiting factors to threatened and endangered populations	Rejected	Would result in significant impacts to visitor use and Park operations.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with Director's Order 12, the NPS is required to identify the "environmentally preferred alternative" in all environmental documents, including EAs. According to regulations from the Council on Environmental Quality for implementing NEPA (40 CFR 1505.2), the

environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in Section 101 of NEPA, which considers:

1. fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assuring for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. preserving important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
5. achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources.

The two action alternatives – Alternatives B and C – fulfill the NPS responsibilities as trustees of the environment for future generations; the long-term ability of the No Action Alternative to attain sustainable productivity levels for beach nesting birds and the Northern diamondback terrapin is uncertain. Likewise, Alternatives B and C assure productive and esthetically pleasing surroundings, but the No Action Alternative does not currently provide biologically productive populations of colonial waterbirds and American oystercatchers. The No Action Alternative and Alternative B provide a wide range of beneficial uses of the Park's environment, but Alternative C would impose new limits on recreational use of Sandy Hook and attempt to minimize predator populations; an aggressive predation management program also poses some, albeit small, risks to human health and safety.

All three alternatives would preserve important natural aspects of the National Recreation Area, but the No Action Alternative may lead to the abandonment of Sandy Hook as a nesting area for some beach nesting birds, reducing biodiversity of the Park's biological resources. Alternative C would limit the diversity of predators but potentially increase the diversity of beach nesting birds (e.g., allowing black skimmers to begin nesting at the Park again). A balance between recreational use and natural resource protection would be maintained by each of the alternatives, allowing 2.5 million annual visitors to enjoy the scenic, cultural and natural resources of Sandy Hook. No renewable or depletable resources would be affected by any of the alternatives.

The Environmentally Preferred Alternative is Alternative B, the proposed action, as it best meets the six goals of NEPA as listed above. The No Action Alternative is least likely to provide for the sustainable productivity of beach nesting birds and Northern diamondback terrapin, maintains the current zero productivity for colonial waterbirds and American oystercatcher, and could contribute to a decline in biodiversity if beach nesting birds start to abandon Sandy Hook for more suitable nesting sites. Alternative C would expand the protection zones of the Park, limiting recreational use and enjoyment of some of the Park's natural resources and would substantially reduce predator populations (albeit to the presumed benefit of beach nesting birds).

COMPARISON OF THE ALTERNATIVES

The No Action Alternative could potentially lead to abandonment of Sandy Hook as nesting habitat by some species such as least tern, common tern and American oystercatcher, which have had zero productivity in recent years. Human disturbance in protected areas would continue without increased stewardship/monitoring and enforcement of these areas during the breeding season. Predation losses to piping plover would likely continue at unacceptable levels, possibly reversing the long-term trend of Sandy Hook providing a significant contribution to the recovery of the species in the state of New Jersey and the New York – New Jersey Recovery Unit. The population of red fox in the Park may increase under the No Action Alternative, allowing these predators to further expand their range into Sea Bright and cause significant predation losses of beach nesting birds in those areas. The No Action Alternative, consequently, does not meet the purpose and need of the proposed action to increase bird productivity. Furthermore, the Park's current trapping and relocation program for red fox is not likely to receive state permits in the future, rendering the No Action Alternative not feasible to permit. The No Action Alternative is likely to adversely affect least tern, American oystercatcher, common tern, and Northern diamondback terrapin.

Administratively, the No Action Alternative is the least efficient for Park Operations because it continues single species management and provides outdated information to the Park, its stakeholders and the public regarding the status and distribution of shoreside threatened and endangered species at Sandy Hook. The No Action Alternative requires additional coordination on the part of Park staff as there is no mechanism for maintaining current information on shoreside threatened and endangered species. Individual Park projects are managed separately, resulting in difficulty and inefficiency during implementation and reporting compliance to regulatory agencies.

Alternative B, the Preferred Alternative, meets all of the objectives of the proposed action by limiting human disturbance and predation impacts on shoreside Special Status Species using methods that are feasible to implement and are consistent with the existing requirements of USFWS consultations and NPS management policies. The productivity of beach nesting birds is expected to increase significantly with implementation of the proposed Shoreside Species of Concern Conservation Plan. This alternative is also likely to allow the Park to address factors limiting the reintroduction of Northeastern beach tiger beetles, significantly contributing to the recovery of this species in the New Jersey Geographic Recovery Unit. Seabeach amaranth, seabeach evening primrose, and seabeach knotweed would also benefit from implementation of Alternative B, as these plants (as they occur) would be protected from human disturbance and NPS operations. As predators populations are reduced to acceptable levels, species such as red fox and raccoons would be impacted with higher mortality levels than the No Action Alternative, which does not actively use lethal means to control predators. Relocating red fox, the dominant predator at present, within the Park is not practical due to the territorial nature of red fox. Alternative B is the Environmentally Preferred Alternative.

Alternative B would improve Park Operations by bringing all the existing, disparate management actions under one comprehensive administrative umbrella; this is likely to result in greater efficiency for Park staff as reporting requirements are consolidated. Additional monitoring of

Table 6. Comparative Summary of Alternatives, including whether each meets the needs of the project.

Comparative Summary of Alternatives		
Alternative A: No Action	Alternative B: the Preferred Alternative	Alternative C
<p>ACTION: Maintain the current suite of management activities</p> <p>Meet Project Needs?</p> <p>The No Action Alternative does not meet the need to manage shoreside threatened and endangered species efficiently and effectively. Continuing status quo management would likely not reverse the decline of beach nesting birds. High rates of predation would continue and be exacerbated because the trapping and relocation permit/program for red fox is no longer feasible under NJDEP authority.</p>	<p>ACTION: Shoreside Species of Concern Conservation Plan</p> <p>Meet Project Needs?</p> <p>The Preferred Alternative meets all of the objectives of the proposed action by limiting human disturbance and predation impacts on shoreside Special Status Species using methods that are ecologically, financially, and operationally feasible to implement and enforce, and are consistent with the existing requirements of USFWS consultations and NPS management policies. Populations of predator species would likely be substantially reduced through cost-effective, lethal means.</p>	<p>ACTION: Shoreside Community Protection Plan</p> <p>Meet Project Needs?</p> <p>Alternative C would meet the objectives of the proposed action, fulfilling the purpose and needs by proactively managing the Park for the protection of Special Status Species. Visitation and recreational use would be negatively impacted through the closure of an additional area to recreational use. Predator populations would be minimized. Park operations would be impacted as staff and resources would be reallocated from other important projects in order to enforce the new closure and restrictions.</p>

state-listed species would increase the scope of Park Operations to be more comprehensive of the shoreside community, but is likely to require higher costs and trade-offs with other Natural Resource management activities. The identification, tracking and management of individual problem predators is anticipated to result in greater time requirements of Natural Resource staff as well.

The implementation of Alternative C would also meet the objectives of the proposed action, fulfilling the purpose and needs by proactively managing the Park for the protection of Special Status Species. Visitors would be negatively impacted through the closure of the Fishing Trail Access area to recreational use, however. Park Operations would also be substantially affected by implementation of Alternative C as it would require a reallocation of staff and resources to establish and enforce the new closure area and to maintain large fox den management buffers around existing protection areas. And the aggressive predation management included in Alternative C would likely result in significantly higher and unnecessary mortality levels for

target species such as red fox, raccoons, gulls and crows as this alternative attempts to minimize predator populations from the Park.

SUMMARY OF THE ENVIRONMENTAL CONSEQUENCES

The environmental consequences of each alternative were assessed, with the duration (how long the impacts are expected to last – short-term or long-term) and intensity (i.e., negligible, minor, moderate, major) of each potential impact determined; the Impact Analysis section describes the potential impacts in detail, with a summary provided here. The No Action Alternative is expected to affect Special Status Species negatively overall, because the recent population and productivity declines in plovers and beach nesting birds would continue and potentially increase (Table 7). Continuation of existing management activities is likely to adversely affect several NJ State-listed Special Status Species (American oystercatcher, least tern, common tern, and Northern diamondback terrapin). Cumulative impacts to Special Status Species are expected to be moderate and long-term due to the widespread manipulation of habitat from historic and ongoing coastal development and shoreline stabilization efforts throughout the state.

Table 7. Qualitative comparison of Park-wide environmental consequences for the three alternatives. (Note: All potential effects were determined after comparison with the existing conditions (baseline environment) or No Action Alternative.)

Resource	Alternative A: No Action	Alternative B: Preferred Alternative	Alternative C
Special Status Species	⊖	⊕	⊕
Targeted Predator Species	□	□	⊖
Other Plant and Wildlife Species	□	⊕	⊕
Wetlands	□	⊕	⊕
Recreation Opportunities	□	□	⊖
Human Safety	□	□	□
Visitor Ability to Enjoy Wildlife	□	⊖	⊕ / ⊖
Socioeconomics	□	□	⊕ / ⊖
Park Operations	□	⊖	⊖
Classification ⊕ Potential positive effects □ No substantial change from existing conditions (baseline) ⊖ Potential negative effects			

Impacts to targeted predator species would be minor, short-term and reversible; cumulative impacts would be minor and short-term since existing trapping and relocation efforts would continue but would not significantly affect statewide populations. Other plant and wildlife impacts are not expected, and cumulative impacts would be minor and long-term as the Park continues management of invasive, exotic species of vegetation. No wetland impacts are anticipated but cumulative impacts to wetlands would be minor and long-term due to the presence of hard structures along 65% of the intertidal bayside shoreline in the Park. No impacts to recreational opportunities are expected; cumulative impacts to visitor experience would be minor but short-term as seasonal closures of protection zones continue. Anticipated impacts to human safety would be negligible due to existing natural and human-induced risks such as swimming in the Atlantic Ocean. No impacts to the ability of visitors to enjoy the Park's wildlife are expected. Impacts to Park Operations, including cumulative impacts, would be minor and long-term because of recent funding and staffing limitations. No socioeconomic impacts are anticipated, as no changes would occur in Park management of biological, cultural or historic resources. The No Action Alternative is likely to negatively impact Park resources or values by resulting in the continued decline of threatened and endangered shoreside species.

Alternative B (Preferred Alternative) would affect Special Status Species positively due to a predicted increase in wildlife productivity from a reduction in losses from predation and human disturbance. Cumulative impacts to Special Status Species are expected to be positive, minor to moderate and long-term due to increased productivity, reduced predation, and the potential for an increase in species numbers and species utilizing enforced protected zones. Impacts to targeted predator species would be minor and short-term and long-term as the Park's populations are reduced through implementation of an integrated predator management program; cumulative impacts would be minor to moderate and long-term as predator populations would resume natural levels. Other plant and wildlife impacts would be positive, minor to moderate and short-term and long-term because of an expected increase in productivity, numbers and diversity due to reduction in predation and disturbance within protection zones, and cumulative impacts would be minor and long-term due to increased productivity, numbers and diversity due to localized reduction in predation and disturbance. Wetland impacts would vary depending on whether habitat restoration projects are implemented when appropriate over time; cumulative impacts to wetlands would be minor and long-term due to the widespread stabilization of New Jersey shoreline habitats.

Impacts to recreational opportunities would be minor and long-term with improved education, enforcement and management of existing protection zones; cumulative impacts would be minor but short-term with improved enforcement of existing protection zones. Anticipated impacts to human safety would be short-term and negligible to minor as all precautions are taken during predation management activities, and cumulative impacts would be negligible. Impacts to the visitor enjoyment of the Park's wildlife would be negligible to minor and short-term and long-term as an increase in wildlife numbers and diversity is anticipated, but increased enforcement of protection zones would limit access during the most biologically productive periods and the reduction in predator populations would result in a minor, negative, and long-term impact to the ability to enjoy those particular species; cumulative impacts would be minor and long-term. Impacts to Park Operations, including cumulative impacts, would be moderate and long-term with an increased need for manpower and resources for increased management and protection

efforts. Socioeconomic impacts are expected to be negligible to minor, short and long-term associated with increased costs of Park Operations and no change to public visitation. No impairment of Park resources or values is expected with the Preferred Alternative.

Alternative C is not likely to adversely impact any of the Special Status Species, and is expected to result in positive minor to moderate benefits to all of the species of concern due to a predicted increase in productivity from a significant reduction in losses from predation and human disturbance. Cumulative impacts to Special Status Species are expected to be positive, moderate to major, and long-term due to an anticipated increase in productivity and the potential increase in numbers and species diversity in expanded protection zones. Impacts to targeted predator species would be negative, moderate and reversible; cumulative impacts would be moderate and long-term as local predator populations are minimized.

Other plant and wildlife impacts would be positive, minor to moderate, and short and long-term with increased productivity, numbers and diversity due to a major reduction in predation along with reduced disturbance and expanded protection zones; cumulative impacts would be minor and long-term resulting from increased productivity, numbers and diversity due to a major reduction in predation along with improved enforcement for reduced disturbance within protection zones as well as in expanded protection zones. Wetland impacts would vary depending on whether habitat restoration projects become appropriate over time; cumulative impacts to wetlands would be minor and long-term due to the widespread stabilization of New Jersey shoreline habitats.

Impacts to recreational opportunities would be moderate and long-term due to expanded protection zones reducing areas available for recreation during the critical breeding season; cumulative impacts would be moderate but short-term due to expanded seasonal protection zones. Anticipated impacts to human safety would be short-term and negligible to minor, and cumulative impacts would be negligible. Impacts to the ability of visitors to enjoy the Park's wildlife would be minor to moderate both short and long-term due to a predicted increase in wildlife numbers and diversity but expanded protection zones that reduce viewing access during peak seasons. Cumulative impacts would be moderate and long-term. Impacts to Park Operations would be moderate and long-term; cumulative impacts would be major and long-term with a greater need for significant manpower and resources for increased enforcement, management and protection efforts. Socioeconomic impacts would be positive and negative, minor, short-term impacts due to potential increase in ecotourism but higher costs of impacts to Park Operations. No impairment of Park resources or values is expected with Alternative C.

III. AFFECTED ENVIRONMENT

NATURAL RESOURCES OF THE SHORESIDE ECOSYSTEM

Sandy Hook's shoreside natural community supports a diverse and complex assemblage of hundreds of plants and animals specialized and adapted to this dynamic and fragile coastal zone. Wildlife considered to be Special Status Species include those that are classified as federally- or state-threatened or endangered, of management priority in existing regional or national conservation plans, or of significant resource value. The predator species that threaten Special Status Species are also considered a part of the current shoreside ecosystem. Other, more common plant and animal species include hundreds that are not classified as Special Status Species but contribute to the shoreside ecosystem in terms of biodiversity, predator-prey relationships, food sources for other wildlife, or other important functions and values. Wetlands are valuable habitats that provide nesting, foraging and roosting habitat for a variety of the Park's wildlife, including several Special Status Species.

Special Status Species

State and federal species that are considered Special Status Species for this Environmental Assessment have been previously described by a wide range of scientific and management literature, including ASMFC (1998), eFlora (2006), Harrington (2001), MANEM (2004), NatureServe (2006), Ner and Burke (2005), NJDEP (2002a – g), USFWS (1993; 1994a, b; 1996a, b; 1998; 2002a, b; 2003a, b; 2005a, b; 2006b, c), and Weakley and Bucher (1992). Appendix E summarizes the biological background information available for each of the Special Status Species, including the status and distribution of the species within the Park; Sandy Hook's importance to the regional and/or national populations of several of these species is discussed below.

Importance of the Sandy Hook Piping Plover Population

The recovery plan for the Atlantic coast population of the piping plover (USFWS 1996a) delineates four recovery units or geographic subpopulations within the population: Atlantic Canada, New England, New York-New Jersey, and Southern (Delaware, Maryland, Virginia, and North Carolina). Recovery criteria established within the recovery plan defined population and productivity goals for each recovery unit, as well as for the population as a whole. The plan states: "A premise of this plan is that the overall security of the Atlantic Coast piping plover population is profoundly dependent upon attainment and maintenance of the minimum population levels for the four recovery units. Any appreciable reduction in the likelihood of survival of a recovery unit will also reduce the probability of persistence of the entire population" (USFWS 1996a, p. 54).

Sandy Hook falls within the NY-NJ Recovery Unit, which has a population goal of 575 (maintained for 5 years) and a five-year average productivity goal of 1.50 chicks fledged per pair (USFWS 1996a). The *U.S. Shorebird Conservation Plan* endorses these goals (Brown *et al.*

2001, Clark and Niles 2000). Partners In Flight recommends a population target of 150 breeding pairs of piping plover for New Jersey (Watts 1999).

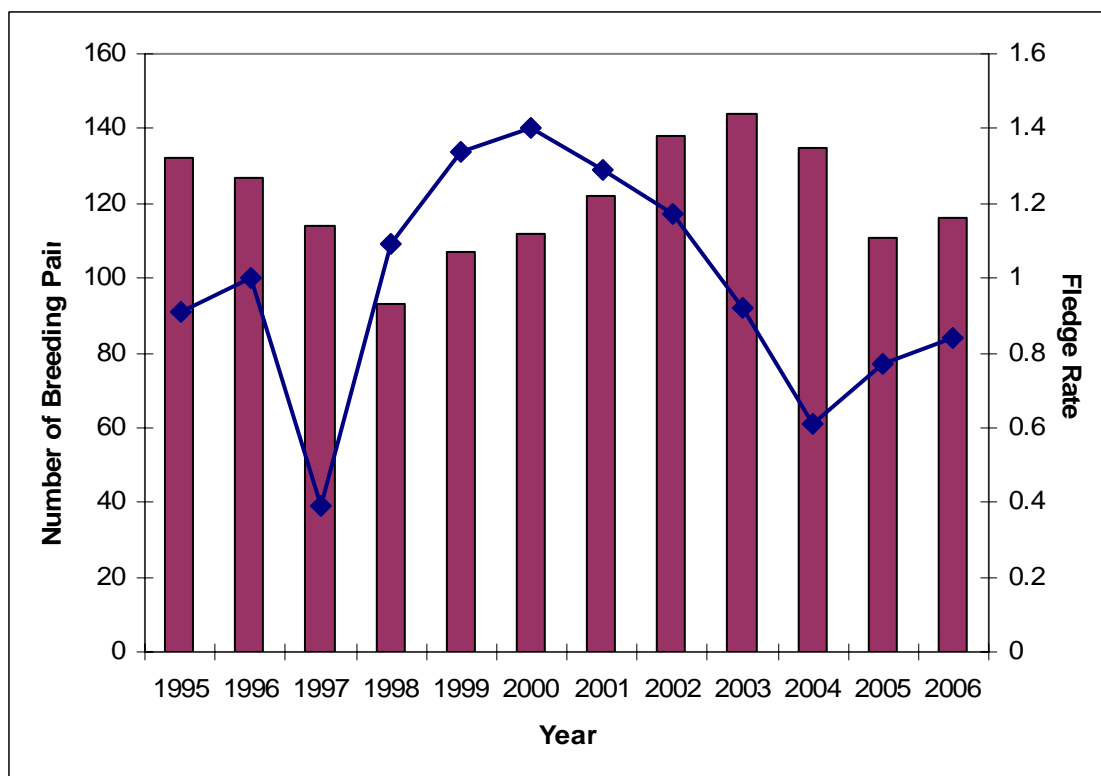
New Jersey piping plover productivity rates have declined from a peak rate of 1.40 chicks/pair in 2000 to 0.77 chicks/pair in 2005 (Table 8, Fig. 5). Statewide productivity remains below the modeled recovery goal for population growth (1.50 chicks/pair), and the breeding populations in New Jersey declined from 2003 through 2005 after several years of increasing. Low productivity in preceding years is thought to be the dominant cause of New Jersey's declining breeding population, and there is concern that the breeding population would continue to decline unless productivity can be improved (Jenkins and Pover 2004a). Flooding, abandonment and predation are the leading causes of nest loss in New Jersey, with flooding the leading cause from 2001-2003 and in 2005 and predation the top cause in 2004 and 2006; the total proportion of nests and broods lost to predation, however, is likely underestimated with just over half of the nests lost attributed to abandonment suspected to actually have been lost to predator activity in 2005 (Jenkins and Pover 2004b, Pover *et al.* 2006).

Sandy Hook contributes a significant portion of piping plover nesting and productivity to New Jersey's statewide population and thus to the New York-New Jersey recovery unit. From 1995 to 2004, Sandy Hook supported an average of 28.4 percent of the known breeding pairs and 23.6 percent of the active nesting areas in New Jersey (USFWS 2005a). The proportion of the state's piping plovers nesting at the Park has ranged from a low of 19.8 percent (in 2005) to a high of 36.8 percent (in 1997). The percentage of piping plover chicks fledged in the Park has averaged 34.3 percent of the total number of chicks fledged in the state, and the productivity of the Park's nests has exceeded the statewide average for 8 of the last 10 years (USFWS 2005a). "With Sandy Hook supporting such a large percentage of nesting pairs, success or failure of breeding at

Table 8. Breeding piping plover abundance and productivity for New Jersey from 1995-2006. (Sources: USFWS 2005a, and Pover *et al.* 2006).

Year	Total Breeding Pairs	Fledge Rates
1995	132	0.91
1996	127	1.00
1997	114	0.39
1998	93	1.09
1999	107	1.34
2000	112	1.40
2001	122	1.29
2002	138	1.17
2003	144	0.92
2004	135	0.61
2005	111	0.77
2006	116	0.84
AVERAGE	121	0.98

Figure 5. Breeding piping plover abundance (bar) and productivity (line) for New Jersey from 1995-2006.



Sandy Hook greatly influences Statewide piping plover breeding success and, consequently, impacts whether or not annual recovery goals for the New York – New Jersey recovery unit are met” (USFWS 2005a, p. 28).

In 2005, productivity in the NY-NJ recovery unit (1.28 chicks fledged per pair) exceeded long term averages (1.19 chicks fledged per pair) but remained below the recovery goal of 1.50 chicks fledged per pair. The estimated total 2005 U.S. Atlantic Coast breeding pair count of 1,415 pairs was slightly lower than its peak of 1,423 pair the year before and still less than the recovery goal of 1,600 breeding pair (Table 9; USFWS 2004, 2005c, and 2006a). The New England recovery unit has been declining in the number of breeding pairs since 2002. The Southern recovery unit, on the other hand, reached an all-time high in its number of breeding pair in 2005 (Table 9). The number of breeding pair in the NY-NJ recovery unit was increasing annually from 1998 to 2003, when it peaked at 530 pair, before declining to an estimated 485 pair in 2004, well below the recovery goal of 575 pair (USFWS 2004, 2005c and 2006a).

Table 9. Regional and national piping plover abundance and distribution for 1990 to 2005. Numbers in parentheses are preliminary estimates. (Sources: USFWS 2004, 2005c, and 2006a)

	Pairs															
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
New England Region	228	240	297	376	449	552	590	612	627	624	623	641	699	687	(659)	(630)
New York	197	191	187	193	209	249	256	256	245	243	289	309	369	386	(384)	374
New Jersey	126	126	134	127	124	132	127	115	93	107	112	122	138	144	135	111
NY - NJ Region	323	317	321	320	333	381	383	371	338	350	401	431	507	530	(519)	(485)
Southern Region	201	194	172	181	186	217	189	204	203	182	183	208	209	203	245	300
U.S. Total	752	751	790	877	968	1150	1162	1187	1168	1156	1207	1280	1415	1420	(1423)	(1415)

NOTES: The New England recovery unit region includes Maine, New Hampshire, Massachusetts, Rhode Island and Connecticut. The Southern recovery unit region includes Delaware, Maryland, Virginia, North Carolina and South Carolina. The only statewide count tallied in New York starting in 1994 is the window census.

Importance of the Sandy Hook Red Knot Population

The USFWS designated the red knot as a Candidate species on September 12, 2006 (USFWS 2006c). New Jersey has designated the red knot as a threatened species and several conservation efforts have identified it as a highly imperiled species. The U.S. Shorebird Conservation Plan has classified the red knot as a Species of High Concern (Brown *et al.* 2001) and regionally as Highly Imperiled (Clark and Niles 2000), and the National Audubon Society placed it on their yellow WatchList. The USFWS has listed the red knot as a North American Wetland Conservation Act (NAWCA) Priority Species and a Bird of Conservation Concern (USFWS 2002c). The species has been identified as a Northeast Species of Conservation Concern by the Northeastern Association of Fish and Wildlife Administrators. These rankings reflect a serious and dramatic population decline in recent years. Clark *et al.* (1993) estimated that the number of red knots using Delaware Bay in the spring of 1989 as 94,460. But by 1994 the estimated population had fallen to approximately 50,000 birds and in 2004 only 13,315 red knots were counted in Delaware Bay – an alarming drop of more than 85% in only 15 years (Niles *et al.* 2005).

Although Sandy Hook is estimated to host only 30 to 50 migrating red knots annually, alternative habitats in New Jersey and Delaware may increase in importance if the horseshoe crab resource in Delaware Bay continues to decline. The North Atlantic region “is critical to the survival of the hemispheric populations of some species” such as red knot (Clark and Niles 2000). The bayside of Stone Harbor has seen a dramatic rise in the number of migratory red knot in the last few years (A. Scherer, USFWS, personal communication), and with such a precipitous population decline, every migratory habitat is likely to increase in value to the species.

Importance of the Sandy Hook Northeastern Beach Tiger Beetle Population

The Northeastern beach tiger beetle population currently is separated both physically and genetically into two populations, one in the Chesapeake Bay and the other along the Atlantic coast (USFWS 2005a). The species’ USFWS recovery plan designated nine Geographic Recovery Areas (GRAs), with Sandy Hook occurring in GRA 4 -- Sandy Hook to Little Egg Inlet, New Jersey (USFWS 1994a):

Historically, the Atlantic coast population extended from Massachusetts to central New Jersey (USFWS 1994b). The boundaries of GRA 4 include all current and historic Northeastern beach tiger beetle habitat in New Jersey. In a statewide survey in 1993, only three sites in the state were found suitable for supporting Northeastern beach tiger beetles: Sandy Hook, Island Beach State Park, and the Edwin B. Forsythe National Wildlife Refuge (NWR) (Hill and Knisley 1994; USFWS 1994b). Sandy Hook contains the only current population of the species in the state, which was reintroduced to the Park in 1994 with 400 larvae captured at suitable sites in the Virginia portion of Chesapeake Bay (USFWS 1994b). Additional reintroductions of larvae to the Park have continued through 2006 (Table F-6). Consequently, the Park currently supports the only population within its GRA.

The USFWS recovery plan calls for at least one site within each GRA to have a self-sustaining peak beetle count of greater than 500 adults (USFWS 1994a, 2005a). USFWS (2005a) concludes that “at least three populations must be established and permanently protected within New Jersey” and that “reestablishment of viable populations at each of these sites [Sandy Hook, Island Beach State Park, and the Edwin B. Forsythe NWR] will be necessary to meet recovery objectives for this species” (p. 16). The Northeastern beach tiger beetle is currently extirpated from Rhode Island, Connecticut and New York, with the only known extant Atlantic coast populations found in southeastern Massachusetts and at Sandy Hook (USFWS 1994a, 2005a). The Sandy Hook population of Northeastern beach tiger beetles, therefore, is vitally important to the regional population of the species.

The Chesapeake Bay populations of Northeastern beach tiger beetle are relatively stable with minor fluctuations, such as after Hurricane Isabel in 2003 (M. Drummond, USFWS, personal communication; Table 10). The highly variable nature of Northeastern beach tiger beetle population densities and a lack of life history information make population trends difficult to identify (USFWS 2005a). “Surveys may be confounded by differences in weather, disturbance, time of year, time of day, cloud cover, immigration, or differences in surveyor methodology (Knisley and Hill, 1998)” (USFWS 2005a, p. 19). Nevertheless, the Sandy Hook population of Northeastern beach tiger beetles plays an essential role in the recovery of the species in New Jersey and throughout its range.

Table 10. Northeastern beach tiger beetle populations in Chesapeake Bay, with a core population on both shores of Virginia and a smaller population in Maryland. Note that these populations reflect surveyed metapopulations and that all population totals are minimum values since none of the years include surveys from the entire Chesapeake Bay population. The 2004 data do not include a complete survey of the eastern shore of Virginia and thus are a minimum population total for that location. (Source: M. Drummond, USFWS, personal communication)

Year	Surveyed Population	Location
2001	33,813	Chesapeake Bay, MD and Western Shore of VA
2002	35,385	Chesapeake Bay, MD and Eastern Shore of VA
2004	24,074	Chesapeake Bay, VA only
2005	57,799	Chesapeake Bay, VA only

Importance of the Sandy Hook Seabeach Amaranth Population

Seabeach amaranth was added to the List of Endangered and Threatened Wildlife and Plants as a threatened species in 1993. The listing was based upon the loss of seabeach amaranth from two thirds of its historic range, and continuing threats to the populations that remained at the time (USFWS 1993). Table 11 summarizes the surveyed population of seabeach amaranth throughout its known range from 1987 through 2005.

Historically, seabeach amaranth occurred in nine states from Massachusetts to South Carolina. Long Island, New York, supports the largest population of seabeach amaranth (Table 11). New Jersey's population grew to over 5,700 plants in 2005, but North Carolina remains one of the species' holdfasts. The rangewide data presented in Table 11 are likely a conservative estimate of the species' entire population, since many known sites were not surveyed in certain years (USFWS 2002a). There are no surveyed seabeach amaranth totals for 1989 due to Hurricane Hugo. Timing of surveys and survey methodologies were variable from site to site and year to year. For example, only 30 of 41 known amaranth sites in North Carolina and 3 of 16 known sites in South Carolina were surveyed in 2000. Results from 1991 should be discounted because survey efforts were low in the Carolinas. Population sizes from 1994 to 1997 reflect increasing survey efforts in New York, almost no surveys of South Carolina, and surveys of only about half of the known North Carolina sites (USFWS 2002a). As a result, the estimated total number of seabeach amaranth plants in those years was probably underestimated. Somewhat increased survey efforts for the period 1998-2000 do not account for the large population increase relative to previous years, however (USFWS 2002a).

Table 11. Abundance and distribution of seabeach amaranth throughout its range from 1987 through 2005. (Source: D. Suiter, USFWS, personal communication)

Year	RI-CT- MA	NY	NJ	DE	MD-VA	NC	SC	Total Surveyed Population
1987	0	0	0	0	0	3,395	1,341	4,736
1988	0	0	0	0	0	4,433	1,800	6,233
1989	0	0	0	0	0	0	0	0
1990	0	331	0	0	0	1,127	188	1,646
1991	0	2,251	0	0	0	1,170	0	3,421
1992	0	422	0	0	0	6,148	15	6,585
1993	0	195	0	0	0	12,386	0	12,581
1994	0	182	0	0	0	7,598	560	8,340
1995	0	599	0	0	0	20,716	6	21,321
1996	0	2,263	0	0	0	3,042	0	5,305
1997	0	7,990	0	0	0	741	2	8,733
1998	0	8,599	0	0	2	5,440	141	14,182
1999	0	19,155	0	0	1	230	196	19,582
2000	0	138,602	1,039	32	4	57	2,312	142,046
2001	0	179,305	5,813	83	878	628	231	186,938
2002	0	190,589	10,908	423	857	2,583	0	205,360
2003	0	112,148	5,084	13	481	6,989	1,381	126,096
2004	0	30,830	6,820	4	533	7,904	2,110	48,201
2005	0	11,092	5,795	9	558	13,740	0	31,194

Table 12. Abundance and distribution of seabeach amaranth in New Jersey since its discovery in 2000. (Sources: D. Suiter and W. Walsh, USFWS, personal communications)

Year	Sandy Hook	Sea Bright	Monmouth Beach	Southern Monmouth	Ocean County	Atlantic County	Cape May County	Year Totals
2000	120	823	96	0	0	0	0	1,039
2001	561	4,701	482	23	10	35	1	5,813
2002	904	9,117	784	92	8	1	2	10,908
2003	542	4,215	178	10	29	8	102	5,084
2004	1,667	3,807	1,237	32	14	1	62	6,820
2005	3,280	1,493	883	100	10	0	29	5,795

Seabeach amaranth was last recorded in NJ in 1913 and in Monmouth County in 1899 (USFWS 2002a, 2006b), but was rediscovered in July 2000. It is considered by the NJ Natural Heritage Program to be globally rare (G2), and has recently been rediscovered in five of the nine states in which historic records occurred. Table 12 summarizes the population distribution of these newly documented populations in NJ. In 2005, 3,280 plants were found on Sandy Hook, the highest density of the species in New Jersey (Table 12). Sea Bright, immediately south of Sandy Hook, has consistently supported the highest abundance of New Jersey's seabeach amaranth plants in previous years (2000 – 2004) but has declined significantly since peaking in 2002 (USFWS 2006b).

Populations of seabeach amaranth at any given site are extremely variable (Weakley and Bucher 1992) and can fluctuate by several orders of magnitude from year to year. The primary reasons for the natural variability of seabeach amaranth are the dynamic nature of its habitat and the significant effects of stochastic factors such as weather and storms on mortality and reproductive rates. Although wide fluctuations in species populations tend to increase the risk of extinction, variable population sizes are a natural condition for seabeach amaranth and the species is well adapted to its ecological niche.

USFWS (2002a, p. 55) notes that “[d]espite the natural variability of seabeach amaranth's population size and distribution and inconsistent survey efforts, some trends can be discerned from the available data. The species has undergone a significant geographic expansion, both in terms of the number and distribution of occupied States and counties, and, if the lack of surveys in South Carolina are considered, in terms of number of extant sites. Since the first intensive surveys in 1987, the species extant range has increased approximately 404 miles to the north, but contracted about 31 miles to the south. Numerically, the population has seen a dramatic increase. Equally notable is the geographic shift of the species “stronghold” (in terms of total numbers) from North Carolina to New York.”

This makes the reappearance and population growth of seabeach amaranth at Sandy Hook important both regionally and nationally, as it may become a stronghold for New Jersey's population since the Park provides one of the best relatively undisturbed and natural habitats in the state.

Importance of the Sandy Hook Least Tern Population

Regionally the population of least terns has declined 9.4%, from an estimated population of 15,244 in the 1970s to 13,805 in the 1990s (MANEM 2004). The *North America Waterbird Conservation Plan* lists the least tern as a species of High Concern (Kushlan *et al.* 2002), and Partners in Flight has classified the species as High Priority for the Mid-Atlantic Coastal Plain (Watts 1999). The species has been identified as a Northeast Species of Conservation Concern by the Northeastern Association of Fish and Wildlife Administrators (NEES & WDTC, in press). The North American population of least terns, including those nesting on interior lakes and rivers of the Midwest and Great Plains (which are listed as federally endangered), is estimated at 60,000 to 100,000 breeding birds, and the regional population goal is to increase the breeding population to between 13,600 and 16,600 breeding birds (MANEM 2004). Regionally, the Mid-Atlantic Coastal Plain population is estimated to contain less than 3,500 least terns (Watts 1999).

Least terns are listed as endangered by the state of New Jersey. For the last decade, New Jersey has supported between 14 and 27 nesting colonies of least terns, with a peak adult population of 1,310 to 2,610 birds (Table 13). The New Jersey Wildlife Action Plan calls for increasing and stabilizing the state's population of least terns, which is designated as a species in greatest need of conservation in the state (NJDEP 2005). Sandy Hook provides one of the best least tern nesting habitats along coastal New Jersey, but has not supported a successful colony in recent years, despite continuous attempts by breeding birds. With a peak adult population of 444 birds in 2002, Sandy Hook historically is one of the top locations for least terns in the state. The significant declines in the Sandy Hook nesting population (possibly due to predation losses in previous years) and zero productivity in the last three years, however, have likely contributed to the overall declines in the statewide population over the same time period.

Table 13. Least tern abundance in New Jersey from 1996 to 2005. (Source: NJDEP unpublished data)

	Peak number of adults	Number of nesting colonies
1996	1310	18
1997	2032	14
1998	1870	14
1999	1966	16
2000	1667	21
2001	1510	21
2002	1938	26
2003	2610	27
2004	2024	25
2005	1569	24

Importance of the Sandy Hook Osprey Population

New Jersey's population of osprey once numbered over 500 nesting pairs, with 100 nests at Seven Mile Beach alone in 1884 (NJDEP 2002b). The statewide population reached a low of 68 pairs in 1975 but has been increasing for at least the last two decades, recovering to 366 nests in 2003, the most recent statewide survey (NJDEP 2002b, Clark and Wurst 2005). The osprey was downlisted from endangered to threatened in NJ in 1985. Raritan Bay supported 12 nests that were surveyed in 2005, while the estuaries and marshes in and around the Maurice River and Avalon / Stone Harbor Bays had the highest number of osprey nests (at 61 and 44 respectively; Clark and Wurst 2005). The national population of osprey has been increasing as well, with a nationwide population estimated at 8,000 pair in the early 1980s (Fuller *et al.* 1995).

In 2005, of the 203 osprey nests that were surveyed yielded an average fledge rate of 1.54, an increase of 25% over the 1997-2004 running average and well above the 0.8 minimum fledge rate for a sustainable population. Most of the state's osprey utilize artificial nesting platforms (92%), while only a few used other structures (e.g., channel markers, duck blinds, pilings). Most of New Jersey's osprey nest on the Atlantic Coast (142 of the 203 nests surveyed in 2005), with a smaller proportion nesting on the Delaware Bay coastline (Clark and Wurst 2005).

The number of osprey nests and young at Sandy Hook, then, are a relatively minor contribution to the statewide population (approximately 2%, assuming that the 2005 statewide population was at least 366 pair).

Importance of Sandy Hook for Other Special Status Species

Sandy Hook provides valuable habitat for the remaining Special Status Species, but the importance of this habitat and the populations they support to New Jersey and the region is unknown. The Park contains breeding habitat for the American oystercatcher, common tern, Northern diamondback terrapin, and historically the black skimmer. Roseate terns use the shoreside habitats of Sandy Hook during migration, but currently breed on beaches farther north in New York and New England. The breeding status of the American bittern, black rail, black-and yellow-crowned night herons, and horseshoe crab is uncertain within the Park, but the Park provides suitable habitat for these species. Seabeach knotweed has been observed at Sandy Hook, but the status of sea-milkwort and seabeach evening primrose is unknown. Bald eagles are not currently known to occur at Sandy Hook, but as the New Jersey population of this federally-threatened bird continues to recover, the Park may provide valuable habitat for an expanding population.

PREDATOR SPECIES

The overarching threat to rare shorebirds may be loss or degradation of habitat; however, predation pressure in limited breeding habitat has become a major factor influencing reproductive output and population dynamics. Many shorebird species have extended incubation and fledging times making eggs, chicks and adults vulnerable to predation for long periods. The ground-nesting behavior of shorebirds makes nests highly susceptible to predation. Predation

was found to be the primary cause of nest failure for piping plovers, snowy plovers (*Charadrius alexandrinus*) and killdeer (*Charadrius vociferous*) (Mabee and Estelle 2000). The primary cause of nest failure for American oystercatchers on barrier islands in North Carolina was found to be mammalian predation (McGowan *et al.* 2005). Predation is a major cause of mortality of American oystercatcher hatchlings (Lauro and Burger 1989) as well as in other oystercatcher species (Heg and Van Der Velde 2001; Hazlitt 2002).

Understanding the total composition of local predator communities is a necessary part of developing management plans. Important predator species in New Jersey include red foxes, striped skunks (*Mephitis mephitis*), raccoons (*Procyon lotor*), rats (*Rattus* spp.), gulls (e.g., laughing gull, *Larus atricilla*), crows and cats (feral and free-roaming). Predators on American oystercatcher nests in coastal areas in New Jersey have been reported to include all of these species (Howe 1982; Lauro and Burger 1989). Mammalian predators are a leading cause of nest failure at the egg-laying stage for ground-nesting birds while avian predators are thought to be more significant predators on chicks. Predation was found to be the leading cause of nest and chick loss in a study of piping plovers and least terns breeding along the Missouri River in South Dakota (Kruse *et al.* 2001). Kruse *et al.* (2001) indicated that 98% of known nest losses were attributed to predation by three predators: American crows (*Corvus corvus*), raccoons and mink (*Mustela vison*). Avian predation by American kestrels (*Falco sparverius*) and great horned owls (*Bubo virginianus*) were the leading causes of documented chick mortalities. Other mammalian predators may also be significant nest predators on ground-nesting birds. Ivan and Murphy (2005) observed evidence of predation on Great Plains piping plover nests by coyotes (*Canis latrans*) more often than by other mammal species. Evidence of predation by coyotes on American oystercatcher nests has been observed in New Jersey as well (T. Pover, NJDEP ENSP, personal communication).

The affects of mammalian predation on reducing productivity of ground-nesting avian species can be seen by studying reproductive success on predator-free islands. Birds nesting in such habitat often show high nest success. The complete lack of mammalian predators on Alaskan islands was related to high reproductive success in the black oystercatcher (*H. bachmani*) (Gill *et al.* 2004). Predator-free islands may serve as population sources for many oystercatcher species (Hockey 1996). However, the selection of mammalian predator-free islands may serve as an ecological trap for oystercatchers if the use of these islands exposes the species to other significant causes of nest failure including flooding or increased distance from foraging areas (McGowan *et al.* 2005).

Some ground-nesting species in coastal habitats have taken a novel approach to dealing with high predation pressure. Several species of ground-nesting birds have been reported nesting on roof-tops, which may be functioning as predator-free islands. Hatching success for least terns in roof-nesting colonies was found to be significantly higher than ground-nesting colonies (Gore and Kinnison 1991). The protection from mammalian predators in roof-nesting colonies was likely an influencing factor as no evidence of mammalian predators was found on roofs in the Gore and Kinnison (1991) study. Evidence of predation of eggs and/or chicks by domestic cats (*Felis domesticus*), raccoons and foxes was seen in ground-nesting colonies. Tracks of these predators could often be followed from one empty tern nest to the next (Gore and Kinnison

1991). This is often the case with American oystercatchers as well with tracks of red foxes going directly from one empty nest scrape to the next (T. Pover, NJDEP ENSP, personal observation).

Predation of birds by introduced predators on islands that were once predator-free has led to extinctions in several species. Birds that evolved on these predator-free islands apparently lacked defensive behaviors making them more susceptible to extinction. Introduced predators have a more marked effect on temperate island species than tropical species (Cote and Sutherland 1997), possibly due to a greater lack of defensive behaviors by temperate island species. Opportunistic non-native predators such as feral cats and red foxes can increase mortality of resident bird species, especially ground-nesting species. Introduced red foxes have been linked to declines in avian populations including the endangered California clapper rail (*Rallus longirsotris obsoletus*) (Harding *et al.* 2001). The removal of red foxes in the California clapper rail's range resulted in a strong positive effect on its population over a five-year period. Feral cats are responsible for the extinction of at least 34 bird species worldwide (Nogales *et al.* 2004). Keitt *et al.* (2002) found that the population growth rate for a black-vented shearwater (*Puffinus opisthomelas*) colony on an island in Mexico declined by approximately 5% per annum in the presence of feral cats. As the abundance of these non-native predators increases it becomes necessary to develop and implement effective predator control programs in order to alleviate or eliminate the negative effects that result (Harding *et al.* 2001).

In the State of New Jersey red foxes are an established part of the predator community although they are thought to be an introduced predator. In a review of literature on the historical distribution of red foxes in North America, Kamler and Ballard (2002) suggested that native red foxes were boreal species normally occurring in northern and montane regions in North America. The red fox population in New Jersey is likely a non-native species of European origin. These non-native red foxes are generalist predators that are capable of obtaining high densities in the human altered landscape. Resident bird species typically lack adaptive behavioral defenses to introduced predators making them more susceptible to predation.

Red foxes have been shown to be significant nest predators for a wide variety of ground-nesting bird species including piping plovers, snowy plovers, least terns, American oystercatchers, gray partridges (*Perdix perdix*) and dabbling ducks (Johnson and Sargeant 1977; Minsky 1980; Howe 1982; Lauro and Burger 1989; Sovada *et al.* 1995; Tapper *et al.* 1996; Neuman *et al.* 2004). Most nest loss for snowy plovers nesting on beaches in Monterrey Bay, California were attributed to red foxes (Neuman *et al.* 2004). An electric fence was used to protect a least tern colony in the Cape Cod National Seashore, Massachusetts from red foxes with good success resulting in an increase of the number of chicks fledged per pair (Minsky 1980). The lack of top predators such as coyotes could result in a single-species community with red foxes dominating. Red foxes may be more efficient nest predators causing more harm to local bird populations in this scenario. In fact, nest success for ducks was found to be lower in the absence of coyotes (Johnson and Sargeant 1977; Sovada *et al.* 1995).

It is likely that native predators would not have as deleterious an effect on nest success as introduced predators due to adaptive behavioral defenses that evolved in the presence of native predators; however, the abundance of native predators in certain habitats may be higher than those naturally occurring due to human influence. Unnatural predation rates may be a secondary

factor exacerbating the problem of habitat loss, fragmentation or degradation (Cote and Sutherland 1997). There is increased predatory pressure on ground-nesting birds from predator species that eat human refuse including gulls, crows, raccoons, cats and rats. Densities of mammalian nest predators such as red foxes, striped skunks and raccoons are often high in human-modified environments (Jimenez and Conover 2001). While some of these predators may be native to New Jersey, their densities may be higher than expected in coastal habitats due to the high level of development in these areas.

Proximity of breeding areas to development may increase predator abundances to artificially high levels by providing a supplemental food source to predators. High predation rates in these environments can be very detrimental to ground-nesting species. The higher than expected levels of mammalian predators near human development often results in decreased reproductive success due to extreme nest predation (Erwin 1980; Rounds *et al.* 2004). There is evidence that barrier beach islands have become unsuitable breeding habitats for ground-nesting species due to human encroachment, habitat destruction and invasion of mammalian predators (Erwin 1980; Rounds *et al.* 2004). Mammalian predator abundance appears to be a major factor in colony site selection and reproductive success for terns (*Sterna spp.*) breeding in coastal habitats (Rounds *et al.* 2004) as well as other avian species.

Another factor connecting human development and increased predation pressure on birds relates to avian breeding densities. The reduction of suitable breeding habitat along the Atlantic Coast due to coastal development may force birds to breed in higher than normal densities. Additionally, the lack of alternative nesting areas may result in repeated use of breeding areas over several years by birds. Under these conditions, predator foraging efficiency through learned behavior may be extremely high (Kruse *et al.* 2001). Kruse *et al.* (2001) hypothesized that habitat loss along the Missouri River in South Dakota may be forcing piping plovers and least terns to concentrate nesting activity into areas that might otherwise be avoided due to predation. High densities of breeding birds in limited habitat may actually attract more predators to these areas leading to increased predation pressure (Rodgers 1987). Thus, while predation may be a major factor leading to reduced reproductive output there is a complex relationship between predation pressure, development and habitat availability.

The U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), Wildlife Services manages animals causing damages to private property, agricultural crops, and natural resources using a variety of non-lethal and lethal control methods. In New Jersey, the APHIS Wildlife Services has described its management methods and their application for birds (USDA 2003) and mammals (USDA 2004). Along the Virginia barrier islands, APHIS Wildlife Services has developed management protocols specifically for the management of predators on beach nesting birds (USDA 2005).

Red fox are the dominant predator of piping plovers and their eggs at Sandy Hook, with gulls and crows also responsible for some losses (Table F-4). The NPS currently traps and relocates gulls, red fox, raccoons, opossum, free roaming cats, and unleashed dogs away from shorebird nesting areas (Table 14). The current population of fox at Sandy Hook is estimated at 30 to 40 individuals (NPS, unpublished data), and a female fox can have a litter of 4 to 10 pups a year (Whitaker and Hamilton 1998). The fox live in burrows or dens located near wooded areas,

Table 14. Predation management at Sandy Hook has trapped and relocated 415 animals from 1985 to 2006. The Gulls column represents the number of injured gulls sent to rehabilitators or relocated in the Park. The Dogs column represents the number of dogs captured and either adopted or removed by animal control. The Fox column represents the number of fox hit by cars, trapped and relocated outside the Park, sent to rehabilitators and released outside the Park or euthanized. The Cats column represents the number of cats trapped and either adopted or transferred to the SPCA or Animal Control. The Raccoons column represents the number of raccoons relocated within the Park away from shorebird nesting areas. (Source: NPS unpublished data)

	Gulls	Dogs	Fox	Cats	Raccoons	Annual TOTAL
1985	0	8	0	7	3	18
1986	0	1	0	1	2	4
1987	2	7	0	19	2	30
1988	1	2	0	7	2	12
1989	6	1	0	18	4	29
1990	14	3	0	12	7	36
1991	24	3	0	10	2	39
1992	12	4	0	3	2	21
1993	10	0	1	12	6	29
1994	0	0	0	0	0	0
1995	6	2	3	8	3	22
1996	6	0	1	1	0	8
1997	0	0	1	0	0	1
1998	0	1	1	4	10	16
1999	2	3	0	0	1	6
2000	9	3	0	10	12	34
2001	1	3	0	12	1	17
2002	2	1	0	11	7	21
2003	2	1	2	14	6	25
2004	0	2	5	2	3	12
2005	0	0	10	1	4	15
2006	0	0	13	5	2	20
Species TOTAL	97	45	37	157	79	415

around the edges of grassy fields and marshes and under stable sand dunes. The current population of fox is thought to have become established by individuals who walked over the Highlands bridge or crossed the ice during the winter, sometime during the late 1980s. Red fox are primarily carnivores, eating mice, rabbits and other small rodents, but they will also eat

earthworms, insects, fruits, berries, and garbage left by humans. Fox hunt at night and can adapt their diets and hunting strategies to surrounding opportunities. They may prey upon the eggs, chicks and adult beach nesting birds (NPS 2005). Raccoons appear to be the dominant, if not only, predator on Northern diamondback terrapin nests and adults at Sandy Hook (Ner and Burke 2005).

OTHER PLANT AND WILDLIFE SPECIES

The Park manages 1,696 of the 2,044 acres of Sandy Hook as natural areas. A 284 acre maritime holly forest is the largest of its kind this far north along the Atlantic coast; some of the holly trees are over 170 years old. The state-endangered coast flatsedge (*Cyperus polystachyos*) and state species of concern few-flowered panic grass (*Panicum oligosanthos*), seabeach sandwort (*Honckenya peploides*) and wild wormwood (*Artemisia campestris caudata*) are present in the Park. A complete vegetation survey of the Park is currently underway by the NPS, and a vegetation management plan is under separate development.

Sandy Hook is located along the Atlantic flyway for migratory birds, providing a “critical stopover and foraging habitat for migrating songbirds and raptors” as well as nesting and foraging habitat for a number of threatened, endangered and declining shorebird and waterbird species (NJDEP 2005, p. 134). An average of more than 60,000 waterfowl, 20,000 shorebirds and 5,000 raptors seasonally use the Sandy Hook Bay Complex. Approximately 85% of the shorebirds migrating through Sandy Hook are sanderling, ruddy turnstone and semipalmated sandpipers (Chipley *et al.* 2003). The Park has been designated an Important Bird Area by NJ Audubon for its value to birds. Over 300 species of birds are known from the Park.

Sandy Hook provides habitat for approximately 30 species of mammals, 14 reptiles and amphibians, and an unknown number of invertebrates. The mammals include opossum, woodchuck (*Marmota monax*), white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), Eastern gray squirrel (*Sciurus carolinensis*), Eastern cottontail (*Sylvilagus floridanus*), three species of bat, five mice and rat species, and twelve marine mammals. The marine mammals include the whales listed in Table 1 plus the Atlantic bottlenose dolphin (*Tursiops truncatus*), harbor porpoise (*Phocoena phocoena*), and five seals. The eastern hognose snake (*Heterodon platirhinos*) and Fowler’s toad (*Bufo woodhousii fowleri*), the latter of which is a state species of concern, have been reintroduced to Sandy Hook. The number of invertebrate species in the Park, including butterflies, damselflies, dragonflies, moths, beetles and mollusks is unknown.

At least sixteen species of crab, shrimp, lobster and related species are known from the estuarine and marine habitats within the Park. Marine and estuarine invertebrates include the sand dollar (*Echinarachnius parma*), anemone, polychaete worms, and at least six gastropods. The diversity of estuarine and marine fish is unknown but likely typical for mid-Atlantic coastal areas, including anadromous fish and species which use the Park’s salt marshes as a primary nursery area.

WETLANDS

The Sandy Hook peninsula is an accreting sand spit extending from south to north. The peninsula has periodically been breached by inlets at its southern end, creating a barrier island; the most recent temporary breach occurred during the 1962 Ash Wednesday storm when a portion of the seawall failed. Prior to that, a somewhat natural inlet was present from about 1896 to 1900. The construction of the seawall (initiated around 1900 and completed in 1926) stabilized the peninsula's connection to the mainland and significantly affected the natural cycle of overwash and inlet opening and closing in that area. As the peninsula grows through a series of barrier spits that wrap around the north end of the Hook to the northwest, small lagoons have historically been created on the bayside (N. Psuty, Rutgers, personal communication). The dynamic geologic nature of the Hook's growth to the north through time has allowed the abundance and distribution of wetlands within and along the peninsula to fluctuate. Sandy Hook grew northward from the 16th through the 20th centuries. In 1764, the tip of the Hook was only 500 feet north of the lighthouse (NPS 2003a). The extent of intertidal wetlands (including salt marshes) on both the oceanfront and bayside has likely increased over time as the peninsula has grown but been affected by shoreline stabilization on both shores.

Today Sandy Hook includes approximately 100 acres of freshwater and saltwater wetlands. Intertidal wetlands can be found along most of the Park's shoreside areas. Bayside areas that have been stabilized with riprap, bulkheads and other hard structures generally do not provide any wetland habitat. Intertidal wetlands include sandy beaches, sand and mud flats, and salt marsh. The mean tidal range of over 6 feet (2 m) creates wide expanses of intertidal marine and estuarine wetland habitat for the Park's wildlife to use. The interior areas of the Park contain some freshwater herbaceous wetlands and four ponds. North Pond is located north of the Nine Gun Battery Field near the USCG boundary, and provides an important migratory stopover site for shorebirds.

VISITOR EXPERIENCE

Over two and a half million people visit the Park each year. Almost 60 percent of visitors use the Park during the summer, when almost 50,000 people at a time congregate on Park beaches during hot weekends. Less than ten percent of visitors use the Park during winter months, and approximately 30 percent of visitors use the Park during the spring and fall months. Dominant visitor activities at the Park are beach-related and include swimming, sunbathing, beachcombing, bike riding, fishing, and picnicking.

Summer weekends can be very busy at the Park, and when parking lots are full the Park is closed until parking becomes available. This temporarily restricts visitation to the Park. A weekend passenger ferry service also operates from the New York City metropolitan area, depositing visitors at Fort Hancock where buses transport most of them to beach areas (others walk). Allowable recreational activities are described under the No Action Alternative.

Lifeguards are on duty from 10 am to 6 pm daily during the summer on five public beaches (all of the oceanfront public beaches except Lot B in the Critical Zone). Restrooms, outdoor beach

showers and seasonal food service are provided at each of the six beach centers (North Beach, Gunnison Beach, and Lots B, C, D and E). Fishing is allowed anywhere in the Park except within protected beaches and nesting area closures. Nighttime fishing is allowed by permit only.

The Sandy Hook Visitor Center currently is located in the former Spermaceti Cove U.S. Life-saving Station, but will have limited hours as a life-saving museum once new facilities on Fort Hancock are complete. The Visitor Center is open daily from 10 am to 5 pm and features exhibits on the natural and cultural resources of the Park as well as a bookstore. The Fort Hancock Museum will close once the new museum is open; the new museum is under restoration to better display the Park's large collection of cultural, historical, archaeological and natural resource items. The Sandy Hook Lighthouse has tours on weekend afternoons from the spring through the fall.

The Multiuse Pathway extends from the southern boundary of the Park, along the oceanfront side of Hartshorne Drive from South Beach to Guardian Park at Fort Hancock and then along the bayside shoreline in Fort Hancock to the ferry dock. After the Route 36 bridge is replaced, the Multiuse Pathway will connect to the Sea Bright and Highlands Bike Path. Additional hiking trails are available from the Sandy Hook Visitor Center to the beach north of Lot E, from Fishing Beach to north of the Nike Radar Site, from Lots G, I and J to Gunnison and North Beaches, and from the Nine Gun Battery Field to the northernmost Park beaches. An observation deck at North Beach allows visitors to view the harbor, the Park, and have a picnic. The Park is part of the New Jersey Coastal Heritage Trail.

Bird watching is a popular activity, particularly along Plum Island, a boardwalk to Spermaceti Cove, the salt marsh at Horseshoe Cove, North Pond and the fields of Fort Hancock. The NJ Audubon Society operates the Sandy Hook Bird Observatory at Fort Hancock, with exhibits and a bookstore open every day but Monday. The Observatory frequently offers bird watching and other educational programs for Park visitors. NPS staff offer environmental education programs and guided tours for visitors. Many other Park partners who maintain facilities at Fort Hancock also offer visitor programs throughout the summer.

SOCIOECONOMICS

During the summer season, from Memorial Day to Labor Day, the Park charges a \$10 admission fee per vehicle to Sandy Hook. Seasonal passes are available for \$50. These admission fees generate \$2 million in revenue for the NPS, of which 80% is returned to Gateway NRA, most of which is used at Sandy Hook for things like providing lifeguards. The 2.5 million visitors to the Park contribute an unknown amount to the local economy during their visits to Sandy Hook. Approximately 1,000 people currently are employed or served by the NPS (149 in Fiscal Year 2004) and the organizations located at the Park, contributing to the local economy; many of these people live within the Park (NPS 2004a). An additional 300 people, including families, work and/or live at the USCG property (NPS 2003b), and an additional 800 people are expected to be employed at Park facilities at the completion of the Fort Hancock Rehabilitation Project (NPS 2003a).

PARK OPERATIONS

Sandy Hook operated with a \$4.851 million operating budget in Fiscal Year 2004, which was \$2.8 million short of the calculated operational needs of the Park. The Park occasionally receives supplemental funding as the settlement of natural resource damage assessments resulting from environmental damages such as oil spills in the region; these funds are generally utilized to update Park equipment, conduct new scientific surveys or studies, or for capital improvements. In Fiscal Year 2004, the Park had 55 permanent and 94 temporary staff. The staff is divided amongst Law Enforcement, Natural Resources, Cultural Resources, Interpretation, Administrative, and Maintenance. Over 500 volunteers contribute more than 32,000 hours each year in natural and historic preservation, interpretation, research, education and Park maintenance.

The Park's natural resources management operations are described under the No Action Alternative. The NPS also conducts management of cultural, historical and archaeological resources at Sandy Hook, including Fort Hancock and the Sandy Hook Proving Ground. The Sandy Hook Lighthouse is not managed by the Park. Law enforcement personnel are responsible for enforcement operations throughout the Park. The Park operates six beach centers, a Visitor Center, and the Fort Hancock museum. NPS staff provide guided tours and educational programs for the public during the summer months. Staff also work with Park cooperators on natural resource management and education, including the USCG, NOAA Labs, NJ Marine Science Consortium, and Marine Academy of Science and Technology.

IV. ENVIRONMENTAL CONSEQUENCES

The National Environmental Policy Act requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented. This section analyzes the environmental impacts of the three alternatives on natural resources, cultural resources, socio-economics, and visitor and partner experience. These analyses provide the basis for comparing the effects of the alternatives. The NEPA requires consideration of context, intensity and duration of impacts, indirect impacts, cumulative impacts, and measures to mitigate for impacts. The area of potential effects includes the entire shoreside, both oceanfront and bayside, of Sandy Hook where suitable habitat currently or potentially exists for the species covered in the proposed management plan (Fig. 1).

METHODOLOGY

General Definitions

The following definitions were used to evaluate the context, duration, intensity, and cumulative nature of impacts associated with project alternatives:

Context is the setting within which an impact is analyzed. In this EA, the intensity of impacts generally are evaluated within a local (i.e., Sandy Hook shoreside areas) context, while the intensity of the contribution of impacts to cumulative effects are analyzed in a regional context (i.e., the state of New Jersey or for special status species, the federal recovery unit).

Duration is a measure of the time period over which the effects of an impact persist (short-term or long-term).

Cumulative Impact is the impact on the environment that results from the incremental (i.e., additive) impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Intensity is a measure of the severity of an impact. The intensity of impacts to natural resources, visitor experience, Park operations, and socioeconomics is defined as follows:

Negligible –The impact is barely perceptible and not measurable. For natural resources, the undertaking does not appreciably diminish significant populations or habitat.

Minor –The impact is perceptible and measurable. For natural resources, the effects remain localized and confined to a single ecological feature or process contributing to the significance of a larger population or habitat.

Moderate –The impact is readily apparent and appreciable. For natural resources, the impact is sufficient to alter significant features of natural resources, generally involving a single or small group of ecological features or processes.

Major –The impact results in a severely adverse and highly noticeable change. For natural resources, this generally involves a large group of ecological features or processes and/or individually significant species or habitat.

Special Status Species Analysis

In accordance with language used to determine effects on threatened and endangered species under the federal Endangered Species Act (USFWS 2005a), potential effects on special status species were categorized as follows:

- **no effect**, when the proposed actions would not affect special status species or critical habitat;
- **not likely to adversely affect**, when effects on special status species are discountable (*i.e.*, extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial; or
- **likely to adversely affect**, when any adverse effect to listed species may occur as a direct or indirect result of proposed actions and the effect is not discountable or completely beneficial.

Remaining considerations concerning special status species, including conclusions and evaluation of cumulative impacts, are presented in accordance with the general definitions described above (*i.e.*, negligible, minor, moderate, major). As described in impact sections, a determination of “likely to adversely affect” does not necessarily constitute a “major” or “moderate” adverse impact to a species.

IMPAIRMENT ANALYSIS

The NPS *Management Policies 2001* require an analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within a park system unit, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that

otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. However, an impact would more likely constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's Master Plan or General Management Plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. The following process was used to determine whether the various alternatives had the potential to impair park resources and values:

1. The park's enabling legislation, the 1979 *General Management Plan*, its 1990 amendment, and other relevant background were reviewed to ascertain the Park's purpose and significance, resource values, and resource management goals or desired future conditions.
2. Beach and shoreline management objectives specific to resource protection goals at the Park were identified.
3. Baselines have been established for each resource of concern to determine the context, intensity and duration of impacts, as defined above.
4. An analysis was conducted to determine if the magnitude of impact reached the level of "impairment," as defined by the NPS *Management Policies*.

The impact analysis includes any findings of impairment to Park resources and values within the concluding statements of the natural resource impact analysis for each alternative.

IMPACT ANALYSIS

Table 7 summarized the potential impacts of each of the alternatives on the affected environments as described below.

Alternative A: No-Action

Effects on Natural Resources of the Shoreside Ecosystem

Special Status Species

The No Action Alternative has the potential for both beneficial and adverse impacts to federally- or state-listed terrestrial species of concern, including piping plover, least tern, common tern, Northeastern beach tiger beetle, seabeach amaranth, and seabeach knotweed. No effects are anticipated for the aquatic marine mammals or sea turtles (Table 1). The overall impacts to Special Status Species are anticipated to be negative, minor to major (depending on the species), and long-term. The Park would continue to protect Special Status Species by implementing measures specified in its 1992 *Management Plan for the Threatened Piping Plover*, the 2000 *Osprey Management Plan*, and the non-discretionary conservation measures, Reasonable and Prudent Measures, and Terms and Conditions of the four existing Biological Opinions with the USFWS.

Potential Beneficial Effects of No Action on Special Status Species

Many of the Special Status Species benefit from the Park's existing management activities. The creation and maintenance of the Protection Zones around bird nesting areas primarily benefits the piping plover but also provides benefits to all the Special Status Species using the oceanfront beaches by reducing human disturbance to habitat and individual plants and animals during the highly productive summer months. The prohibition of public ORV use of Sandy Hook generates positive effects for the shoreside natural community by minimizing the adverse impacts associated with ORV use on beaches. The Park's prohibition of pets on the oceanfront beaches from March 15 to Labor Day each year benefits shorebirds and waterbirds of concern by minimizing the threats associated with pets on beaches. These beneficial impacts are moderate and long-term.

The Park's existing predation management program protects piping plover nests with exclosures and traps and relocates individual predators away from bird nesting areas. The beneficial impacts of the predation management activities are minor and short-term, however, as few predators are removed to areas outside of the Park and predators can learn how to adapt to the use of exclosures and live traps.

Potential Adverse Effects of No Action on Special Status Species

The NPS does not actively manage the Park for the protection of most state-listed species, allowing natural processes to occur and evolve. As a result, the existing predation management program does not specifically target predators of least terns, American oystercatchers, common terns, or Northern diamondback terrapins and their nests. This results in a major, long-term negative impact to these species, with predation losses up to 100% in recent years. Over time, these species may abandon the Park for more suitable habitat elsewhere.

The existing predation management program has not been substantially effective in improving the recent productivity of piping plovers at Sandy Hook. While the introduction of electrified exclosures on piping plover nests in 2004 improved productivity as compared to non-electrified exclosures, red fox have adapted and taken advantage of periods of low battery charges to defeat the exclosures. Red fox and other predators such as grackles and crows have adapted to harass

incubating plovers and chicks by repeatedly running around or diving at the exclosures, or by perching on top to await the emergence of the birds. Thus the existing predation management program has not been effective in responding to changing conditions, resulting in a moderate, multi-year decline in piping plover productivity. Additionally, because the Park will not be able to obtain a permit due to new NJ DEP regulations/policy to continue to relocate red fox outside of the Park as a management tool, an increase in predation losses would be expected on beach nesting birds.

Although the Park's use of fenced protection zones to limit human disturbance to bird nesting areas provides beneficial impacts to beach nesting birds and plants of concern, impacts from human disturbance still occur. In 2006, eighteen dogs were observed within the protected areas and a total of 184 dogs were observed along the oceanfront beaches. NPS staff documented 78 incidences of kites on protected beaches, and a total of 281 visitors were observed within the protected areas. Moreover, the bayside habitats are not protected from human and pet disturbance, except for Spermaceti Cove, Horseshoe Cove and the Holly Forest. As a result, existing management activities to protect Special Status Species from human and pet disturbance is not foolproof and generates a minor, long-term impact on the oceanfront beaches and a moderate, long-term impact on unprotected bayside habitats.

Adverse impacts to Special Status Species may also occur as a result of the current management activities at Sandy Hook. The NPS has an outdated management plan for piping plover, a separate management plan for osprey, and four Biological Opinions from the USFWS that include 131 separate but sometimes redundant management actions required of the NPS. The No Action Alternative proposes to continue to administer each of these plans and management actions separately, which can generate negative, minor, and long-term impact to the Park's ability to efficiently manage for the protection of Special Status Species.

Appendix G (Table G-1) summarizes the potential impacts to each Special Status Species from the No Action Alternative.

Cumulative Effects

The No Action alternative is anticipated to have an overall negative impact on Special Status Species as multi-year population declines are maintained. A variety of historic, on-going and planned activities would also continue to affect these species. The NPS beach grooming activities, high visitor counts, and allowed recreational activities create moderate but highly localized cumulative impacts to the public beaches of the Park.

Residential development and recreational use facilities in areas throughout coastal New Jersey have resulted in habitat loss and degradation to threatened and endangered species. Associated human disturbance, including driving, hiking on beaches and walking unrestrained pets, also adversely affect species of concern by interfering with reproductive and foraging behavior and result in direct mortality if plants and animals are crushed by beach-driven vehicles or killed by unrestrained pets.

Planned continuance of USACE authorized beach fill and shoreline stabilization projects throughout New Jersey represent continuing shoreline stabilization and preclusion of natural habitat formation in the state and coastwide. Pilkey and Wright (1988) found that 43% of the New Jersey oceanfront coastline was stabilized with hard structures, and USFWS (2002b) identified 90% of the coast as receiving or proposed for USACE beach fill activities (not including the NPS proposed Sand Slurry Pipeline Project at Sandy Hook). Eight of the state's eleven inlets have been stabilized with jetties or other hard structures, eliminating and/or degrading suitable nesting, foraging and roosting habitat for Special Status Species. In areas where erosion had eliminated any beach habitat in front of hard structures, these beach fill projects have restored habitat for some Special Status Species such as piping plover, least tern and seabeach amaranth. Sea Bright and Monmouth Beach, for example, previously provided no suitable habitat for these species but now support 8-10 pair of nesting piping plovers and an average of more than 4,300 seabeach amaranth plants (Pover *et al.* 2006, USFWS 2006b). The maintenance of this new habitat through periodic renourishment, combined with recreational activities that may include ORV and pet use, may result in the habitat being suboptimal however. As a result, the cumulative impacts of the No Action Alternative, in combination with these other historic, ongoing and anticipated actions are negative, moderate and long-term.

Conclusion

The No Action Alternative is predicted to have an overall negative effect on Special Status Species, because the recent reductions in populations and productivity of beach nesting birds would be maintained; with the new constraint of not being permitted to relocate red fox outside of the Park as a predation management tool, the No Action Alternative may increase predation losses of beach nesting birds. Continuation of existing management activities is likely to adversely affect least tern, American oystercatcher, common tern, and Northern diamondback terrapin, and is not likely to adversely affect piping plover, osprey, Northeastern beach tiger beetle, and seabeach amaranth. The overall impact of No Action on Special Status Species is negative, minor to moderate, and long-term. The Park would continue to operate under its existing piping plover and osprey management plans and USFWS Biological Opinions, which incorporate measures to protect species of concern, and would continue to report the results of its inventory and monitoring program to the USFWS and NJDEP.

Targeted predator species

The No Action Alternative is likely to result in short-term, minor impacts to individual predators and negligible impacts to populations of predator species. Several predator species are currently trapped and relocated inside and outside of the Park, negatively affecting the predators, which may be injured by the traps. The issue of humaneness and animal welfare as it relates to the capturing or killing of wildlife for damage management in NJ was evaluated by USDA (2004). The USDA (2004) impact analysis on this topic is herein incorporated by reference. The analysis concluded that the control of mammals causing damages to natural resources, private property, etc., with lethal means could result in "a certain amount of animal suffering" given the current range of technology and resources (USDA 2004, p. 31). New Jersey Wildlife Services and any authorized NPS personnel are experienced and professional in their use of predation

management methods so that they are humane within the constraints of current technology and resources; standard operating procedures and mitigation measures are used to maximize humaneness as described in USDA (2004). As a result, the impacts to animal welfare are anticipated to be minor and short-term.

The cumulative impacts of the existing predation management program at Sandy Hook are short-term and minor, as no long-term or widespread reduction in predator populations or health have been observed.

Other plant and wildlife species

Impacts from the No Action Alternative on other plant and wildlife species are expected to be negative, minor and short and long-term as a result of continuing predation in protection zones and human disturbance that still occurs in protection zones. Cumulative impacts of the Park's existing program to control invasive, exotic species of vegetation is minor and long-term, negatively affecting the removed invasive plants but positively affecting native species.

Wetlands

Under the No Action alternative, no impacts are expected to wetlands, as no action would be taken which would cause impacts. No short or long term effects are anticipated under the No Action alternative, as no action would be taken, and only existing natural and human-induced impacts would continue without the influence of any project actions. Cumulative impacts to intertidal wetlands of Sandy Hook are minor and long-term, since hard shoreline stabilization has eliminated or degraded 65% of the intertidal wetland habitat on the bayside shoreline.

Effects on Visitor Experience

Recreation opportunities

Under the No Action alternative, no impacts are expected to recreation opportunities in the Park, as no action would be taken which would cause impacts. Cumulative impacts would be minor and long-term, since several areas of the Park are currently closed to visitors every year.

Safety

Under the No Action alternative, impacts to visitor safety at Sandy Hook are expected to be negligible. The NPS currently provides lifeguards at each of the high use public beaches from 10 am to 6 pm daily during the summer months, minimizing the risk to human safety from swimming in the Atlantic Ocean. Cumulative effects are anticipated to be negligible under the No Action alternative, as no new action would be taken, and only existing natural and human-induced risks would continue without the influence of any project actions.

Changes in ability to enjoy wildlife

Under the No Action alternative, no impacts are expected to visitors' ability to enjoy wildlife in the Park, as no action would be taken which would cause impacts. No short or long term, including cumulative effects are anticipated under the No Action alternative, as no action would be taken, and only existing natural and human-induced impacts would continue without the influence of any project actions.

Socioeconomics

No impacts are anticipated as the Park would not change its existing management practices.

Park Operations

No action is expected to result in NPS dealing with increased pressure from resource agencies and the conservation community to address the impacts of human disturbance and predation losses on Special Status Species. An expected denial of a wildlife relocation permit from NJDEP would result in the Park's ceasing its current trapping and relocation of red fox outside of Sandy Hook, which would result in a minor, long-term impact to Park Operations by eliminating this management activity. Given recent funding and staffing limitations within the NPS, cumulative effects are expected to be minor and long-term as Natural Resources staff would redirect their time and labor to other needs.

Impairment Statement

The No Action Alternative could adversely affect least tern, American oystercatcher, common tern, and Northern diamondback terrapin, but there is not likely to be an impairment of Park resources or values that are key to the natural or cultural integrity of the Park and that are identified as a goal in the Park's General Management Plan and other relevant NPS planning documents, since the adverse affects to these species are the result of natural predation.

Conclusion

The No Action Alternative is expected to have an overall negative affect on Special Status Species, as predation losses and human disturbance would continue. Continuation of existing management activities is likely to adversely affect four Special Status Species (American oystercatcher, least tern, common tern, and Northern diamondback terrapin) (Appendix G, Table G-1). Cumulative impacts to Special Status Species are expected to be moderate and long-term.

Impacts to targeted predator species would be minor and short-term to individuals and negligible to populations; cumulative impacts would be minor and short-term. Other plant and wildlife impacts are not expected, and cumulative impacts would be minor and long-term. No wetland impacts are anticipated but cumulative impacts to wetlands would be minor and long-term. No impacts to recreational opportunities, the ability of visitors to enjoy the Park's wildlife or socioeconomics are expected. Cumulative impacts to visitor experience would be minor but short-term. Anticipated impacts to human safety would be negligible. Impacts to Park

Operations, including cumulative impacts, would be minor and long-term. The No Action Alternative is not likely to result in impairment of Park resources or values.

Alternative B: Shoreside Species of Concern Conservation Plan

Effects on Natural Resources of the Shoreside Ecosystem

Special Status Species

Although the Preferred Alternative has the potential for both beneficial and adverse impacts to federally- or state-listed terrestrial species of concern, overall impacts of the Preferred Alternative are positive, minor to moderate, and short and long-term. No effects are anticipated for the aquatic marine mammals or sea turtles (Table 1). The Park would continue to protect Special Status Species by implementing measures specified in its 1992 *Management Plan for the Threatened Piping Plover*, the 2000 *Osprey Management Plan*, and the non-discretionary conservation measures, Reasonable and Prudent Measures, and Terms and Conditions of the four existing Biological Opinions with the USFWS.

Potential Beneficial Effects of Alternative B on Special Status Species

The Shoreside Species of Concern Conservation Plan proposed by Alternative B would result in beneficial effects for Special Status Species. Alternative B proposes to implement an Integrated Predation Management Program that would increase the predator control activities of the NPS at Sandy Hook, reducing predator populations and using lethal means if necessary, from areas near nesting Special Status Species. The Preferred Alternative also includes measures to reduce the impacts of human disturbance on Special Status Species and to potentially use habitat restoration measures to increase the availability of important habitat(s) for these species.

The Integrated Predation Management Program is anticipated to result in minor to moderate, short-term to long-term benefits to piping plover, least tern, common tern, American oystercatcher, black skimmer, Northeastern beach tiger beetle, and Northern diamondback terrapin as predators are removed from nesting areas and predation losses reduced. The impacts would be minor to moderate depending on the number of the predators removed, and would be short-term if the predators are relocated within the Park or long-term if lethal means are utilized to permanently remove those individual predators from Sandy Hook.

Measures to reduce the impacts of human disturbance are expected to result in minor, short-term benefits to beach nesting birds. An increase in enforcement of existing restrictions that protect beach nesting birds from human disturbance would result in minor but short-term benefits; benefits are expected to be short-term given the high visitor use of the Park that requires constant enforcement of existing protection measures as new visitors are educated about restrictions and cited for violations. The reduction in law enforcement ORV presence in protected areas is likely to result in minor, long-term benefits to beach nesting birds, Northeastern beach tiger beetle, seabeach amaranth, and seabeach knotweed as the disturbances and adverse impacts of ORV use are minimized. The protection of waterbird colonies with symbolic fencing and buffers is

expected to generate minor, short-term benefits to least tern, common tern and black skimmer (if the latter returns to the Park); the benefits would be minor since the colonies already occur within protected areas and would be short-term, lasting only the length of the nesting season. If the NPS determines that human disturbance is a significant threat to Special Status Species along the bayside or other areas of the Park, measures to reduce human disturbance in those areas are anticipated to generate minor, short-term benefits to those species in those situations.

Minor, long-term beneficial impacts are expected to occur as a result of an improved, more efficient biological monitoring program that includes state-listed species. Updated scientific data that fills knowledge gaps would improve the Park's ability to adaptively and effectively manage Sandy Hook for the protection of Special Status Species.

If and when it may become appropriate to incorporate habitat restoration into the protection of Special Status Species at Sandy Hook, the NPS may improve habitat availability and quality for species of concern through the restoration of habitat such as the removal of encroaching vegetation, recreating wet depressions on the oceanfront beach for foraging shorebirds, or the restoration of sandy beach and/or salt marsh habitat on the bayside. The removal of encroaching vegetation would result in minor to moderate positive, short term to long term impacts on seabeach amaranth and seabeach knotweed; impacts would be minor to moderate depending on the spatial extent of the vegetation removal, with minor impacts expected for localized vegetation removals and moderate impacts expected for large areas of vegetation removal. The positive impacts are expected to be short-term if small-scale, localized vegetation removals are conducted where the vegetation can grow back the following year, or moderate if the removals are more permanent and the vegetation takes several years to grow back. Minor positive impacts to piping plover, least tern, common tern and American oystercatcher would result if the vegetation removal enhances the availability of suitable bare sand nesting habitat for these birds; the impacts would be short or long term depending on the length of time for the vegetation to return.

The recreation of wet depressions on the oceanfront beach would result in the increase of foraging habitat for shorebirds, especially unfledged chicks of the piping plover. This type of foraging habitat is more protected than the intertidal zone where the waves influence foraging behavior, and would result in minor to moderate positive impacts to piping plover. The impacts would be minor to moderate depending on the size, location and prey availability within the wet depression; a wet depression or tidal pool located within the foraging range of active piping plover nests and of sufficient size and prey to support the local piping plover adults and chicks would have greater positive impacts than a smaller pool located away from any nests.

The restoration of bayside sandy beach habitat is likely to result in positive impacts to foraging shorebirds and waterbirds, horseshoe crab, Northern diamondback terrapin, and Northeastern beach tiger beetles. The existing hard stabilization structures on the bayside provide little to no habitat for Special Status Species, and the restoration of sandy beach habitat through small scale, localized beach nourishment is expected to result in moderate, long-term positive impacts by improving habitat availability on the bayside shoreline. The impacts would be long-term as it is expected that the restored beach(es) would last for several years given the relatively low erosion rates along the bayside shoreline.

The potential restoration of salt marsh habitat on the bayside of Sandy Hook would result in positive, moderate and long-term impacts to Special Status Species such as the American bittern, black rail, black-crowned and yellow-crowned night herons, sea milkwort, and Northern diamondback terrapin as habitat availability is improved. To the extent that an increase in salt marsh habitat leads to positive benefits for estuarine fish and invertebrates that utilize salt marshes as primary habitats, minor and long-term beneficial impacts for foraging birds like the least tern, common tern, black skimmer, American oystercatcher, red knot, bald eagle and osprey are anticipated if this habitat improvement is conducted.

Potential Adverse Effects of Alternative B on Special Status Species

Predation losses would not be eliminated under the proposed Integrated Predation Management Program, but would be significantly lessened. Minor, long-term adverse impacts from predation losses are expected to continue with Alternative B as the predator populations would not be entirely eliminated.

While the encouragement of visitors to lessen disturbance to Special Status Species on the bayside could result in minor, short-term benefits to those species, the lack of new restrictions on bayside recreational use would continue the existing long-term, minor to moderate adverse impacts of the No Action Alternative.

Creation of wet depressions within the Northeastern beach tiger beetle areas could result in adverse impacts to this species by disturbing its habitat and individuals. These potential adverse impacts would be avoided and minimized by not creating any wet depressions within the known range of the Northeastern beach tiger beetles.

Beach nourishment, although it would increase habitat availability, may create suboptimal habitat depending on sediment compatibility, seasonal timing of construction and method of construction. Adverse impacts would be avoided and minimized by using sediment compatible with the naturally occurring sands of the bayside shoreline, timing the construction outside of the spawning and nesting seasons of horseshoe crab, Northern diamondback terrapin and other aquatic resources, and by using appropriate construction methods (e.g., not dredging access channels or mining the beach fill material from the estuary bottom).

Appendix G (Table G-2) summarizes the potential impacts to each Special Status Species from the Preferred Alternative.

Cumulative Impacts

Although the overall impact of the Preferred Alternative on Special Status Species is positive, a variety of historic, on-going and planned activities would continue to negatively affect these species elsewhere in New Jersey. The Preferred Alternative would minimize the localized threats of human disturbance, predation losses and potentially habitat availability within the Park. To the degree that biological productivity of Special Status Species is improved, positive

cumulative impacts to the statewide and rangewide populations of these species may occur, generating a minor to moderate, long-term impact.

Conclusion

The Preferred Alternative is anticipated to affect Special Status Species positively overall as productivity increases with reduced predation losses and human disturbance. Implementation of Alternative B is not likely to adversely affect any of the Special Status Species. Positive impacts of varying duration and intensity are expected for piping plover, least tern, common tern, American oystercatcher, osprey, Northeastern beach tiger beetle, Northern diamondback terrapin, seabeach amaranth and seabeach knotweed. Depending on whether they occur within protected or public use areas and if habitat improvements are conducted, positive minor to moderate impacts are expected for American bittern, red knot, bald eagle, black rail, black-crowned and yellow-crowned night heron, black skimmer, roseate tern, sea milkwort, seabeach evening primrose, and horseshoe crab. The Park would continue to implement the non-discretionary protection measures of the USFWS Biological Opinions and would continue to report the results of its inventory and monitoring program to the USFWS and NJDEP.

Targeted predator species

The Preferred Alternative proposes to implement an Integrated Predation Management Program that would target certain predator species that are causing losses of beach nesting birds, Northern diamondback terrapin, and their nests and young. An increase in the use of lethal control methods is expected in order to achieve the management goals of this alternative, generating a negative, minor and long-term impact to targeted predator populations as animals are removed in a safe and humane manner from the Park.

Predator populations have been modified by human development, raising them to unnaturally high levels (Watts 1999). The proposed Integrated Predation Management program aims to restore the ecological balance by reducing predator populations to natural or below natural levels, particularly during the nesting season. These populations are anticipated to return to natural levels at the end of each year as reproduction of predator species continues and vacant niches are filled, minimizing any adverse impacts to predator species. Any impacts would be reversible and retrievable because predator populations are resilient and would quickly return to natural levels in the absence of any NPS management actions.

USDA (2004) evaluated the impacts of lethal wildlife management of raccoons, opossum, skunk, red fox and several other mammal species. This impact analysis is herein incorporated by reference; it concluded that based on oversight (of these targeted predator species as game species) by the NJDEP Division of Fish and Wildlife, the limited take of each species, and increasing or stable statewide populations of raccoons, opossum, skunk, and red fox, impacts to local and statewide populations of these species would be minor. USDA (2005) found that the populations and range of many key avian predators (e.g., gulls) have expanded, and that lethal wildlife management of targeted avian predators is not likely to negatively affect these species so long as population levels remain elevated above those recommended by managing authorities; this impact analysis is also herein incorporated by reference.

The issue of humaneness and animal welfare as it relates to the capturing or killing of wildlife for damage management in NJ was evaluated by USDA (2004). The USDA (2004) impact analysis on this topic is herein incorporated by reference. The analysis concluded that the control of mammals causing damages to natural resources, private property, etc., with lethal means could result in “a certain amount of animal suffering” given the current range of technology and resources (USDA 2004, p. 31). Standard operating procedures and mitigation measures are used to maximize humaneness as described in USDA (2004). The American Veterinary Medical Association (AVMA) has also reviewed methods of humanely euthanizing animals, and has provided a report on the methods acceptable for different animals (AVMA 2001). The proposed Integrated Predation Management Program would use methods approved by the USDA and AVMA, and as a result, the impacts to animal welfare are anticipated to be minor and short-term.

The impacts of Alternative B, in combination with the impacts of Alternative A (No Action), would result in moderate, long-term cumulative impacts to targeted predator species in the Park but minor and short-term cumulative impacts to predator populations in New Jersey.

Other plant and wildlife species

Under the Preferred Alternative, impacts to other plant and wildlife species are expected to be minor and long-term. The Preferred Alternative would result in a reduced threat of predators on vulnerable Special Status Species, which could also result in a positive, minor benefit to other wildlife which are threatened by predation in the Park; this impact would be long-term as long as the Integrated Predation Management Program controlled the predation threat.

In the event that the NPS determines that habitat restoration is necessary in the future to aid the recovery of Special Status Species, potential impacts to other plant and wildlife species could be positive overall, minor to moderate in intensity, and short-term and long-term in duration. The removal of thick vegetation encroaching on bare sand bird nesting areas would negatively affect the plants removed, but impacts would be localized and short-term as the natural processes of vegetative succession would continue. The intensity of the impact would be minor if only small pockets of vegetation were removed, or moderate if large areas were removed. Construction of a shallow intertidal depression on an oceanfront beach could result in minor, short-term positive impacts to foraging shorebirds. Such depressions would be constructed in areas where they would naturally occur and during periods of low biological productivity (late fall to early spring), avoiding impacts to plants and other wildlife. If a salt marsh restoration or beach nourishment project was identified as appropriate on the bayside, the short-term impacts to other plants and wildlife would likely be negative and minor during construction, but the long-term impacts would be moderate and positive as habitat would be restored for the entire ecosystem, not just Special Status Species.

The impacts of Alternative B, in combination with the impacts of Alternative A (No Action), would result in positive, minor, and long-term cumulative impacts to other plant and wildlife species since the existing and proposed management actions benefit entire ecosystems by

increasing productivity, numbers and species diversity by locally reducing predation and human disturbance.

Wetlands

Under the Preferred Alternative, no impacts are expected to wetlands, as no action would be taken which would cause impacts. In the event that the NPS determines that habitat restoration is appropriate in the future to aid the recovery of Special Status Species, potential impacts to wetlands could be positive overall, minor to moderate in intensity, and short-term and long-term in duration. The construction of a shallow intertidal pool on an oceanfront beach, for example, could result in minor, short-term negative impacts to the beach but would generate positive benefits to foraging shorebirds. Impacts would be localized and short-term as natural processes (e.g., waves, tides, winds) reshape the beach and fill in the constructed pool or depression. If a beach nourishment or salt marsh restoration project was determined to be appropriate to restore bayside wetland habitat for Special Status Species, impacts to intertidal wetlands could be minor to moderate in intensity and short or long-term in duration depending on specific design features. The impacts of Alternative B, in combination with the impacts of Alternative A (No Action), would result in minor, long-term cumulative impacts to wetlands since the majority of the bayside shoreline is already stabilized, degrading or eliminating intertidal wetland habitat along 65% of the bayside shoreline.

Effects on Visitor Experience

Recreation opportunities

Impacts to recreation opportunities at Sandy Hook are expected to be minor and short-term with Alternative B since any restrictions on human use (e.g., placing symbolic fencing around colonial waterbird nest sites) would most likely occur within existing protection zones. The expansion of the areas seasonally closed to kites and kite surfing from 500 to 650 feet from shorebird nesting areas would result in a minor, short-term impact to recreational opportunities as well. The impacts of Alternative B, in combination with the impacts of Alternative A (No Action), would result in minor, long-term negative cumulative impacts to recreational opportunities as enforcement of existing protection zones is improved and the seasonal closures are continued every year.

Safety

USDA (2004) evaluated the impacts to human safety from an integrated wildlife damage management program that uses non-lethal and lethal means to control target mammal species, and USDA (2003) did the same for the control of target bird species. These impact evaluations are herein incorporated by reference, since Alternative B proposes to utilize these approved predation management techniques, and possibly use APHIS Wildlife Services (WS) professionals to implement them at Sandy Hook. The USDA evaluations determined that the use of chemical predation management techniques poses no risk to public safety and health if the materials are applied according to label instructions (USDA 2003, 2004). Therefore the impacts

to human health and safety from the use of chemical predation management techniques is expected to be negligible.

The potential use of drugs in the capturing, sedating, handling and euthanizing target predator species was evaluated by USDA (2004) and found to result in no significant harmful impacts to human health if proper standard operating procedures and mitigation measures are used.

To ensure safe use and awareness, NPS or WS employees who use firearms to conduct official duties such as lethal predation management are required to attend approved firearms safety and use training programs. These personnel also require separate authorization from the Park's Superintendent. As a result, the expected impacts to human safety from the potential use of firearms during predation management activities is negligible.

Alternative B would implement an Integrated Predation Management Program that could reduce the populations of problem predators with lethal means, which is anticipated to generate a minor and short-term threat to human safety. The safety risk to Park staff or contractors would be minimized by the use of certified professionals. Visitors may risk stumbling across traps left for predators if they depart from existing trails and pathways in the Park. The risk to visitors from lethal control measures would be minimized by conducting those activities outside of high visitor use periods (e.g., the late winter and early spring months) and away from areas used by the public. The impacts would be short-term because the trapping and removal activities are likely to be conducted over the span of a few months each year. The cumulative impacts of the above actions, in combination with the impacts of Alternative A (No Action), on human safety would be negligible due to the highly localized and controlled nature of the predation management activities.

Changes in ability to enjoy wildlife

No additional beach closures are proposed under Alternative B, resulting in a negligible impact to visitor experience in terms of ability to enjoy the Park's wildlife. Wildlife populations of Special Status Species are expected to increase under the implementation of Alternative B, affording visitors a gain in opportunities to enjoy the Park's wildlife resources, particularly for bird watching and environmental education programs; this gain is expected to be short-term and minor, however, since the majority of the wildlife would be located in protected areas with restricted visitor use. Osprey nests, on the other hand, are typically viewable in several areas of the Park, and increases in the osprey population would accordingly increase bird watching opportunities for visitors. The reduction in the predator population(s), however, is expected to generate a minor, long-term impact to visitors' opportunity to enjoy those particular wildlife species. Red fox, for example, are mostly nocturnal and the Park is closed after sunset; as a result, there would be little to no change in visitors' ability to observe this species. The impacts of Alternative B, in combination with the impacts of Alternative A (No Action), would result in a minor, long-term negative cumulative impact to visitors' ability to enjoy Sand Hook's wildlife since large portions of the Park's shoreside areas are already closed to visitor use during periods of peak biological productivity.

Socioeconomics

No revenue impacts are anticipated as the Park would not change its existing management practices regarding visitation, admission fees, or concessionaires. Associated costs with increased need for manpower and resources for increased management and protection efforts would result in a minor, short and long-term impact to the Park's operating budget.

Park Operations

Alternative B is expected to result in moderate, long-term impacts to Park Operations. The Integrated Predation Management program would increase operational costs at the Park as the NPS would either contract with professionals to trap and remove predators or divert Natural Resources staff resources and purchase additional equipment to conduct the predation management. A trade-off in Park programs would be necessary as Natural Resources staff would devote time and resources to identifying and removing predator animals instead of conducting other activities like outreach and education. Live trapping to remove fox is very time consuming when it is necessary for NPS staff to spend a lot of time looking for bird nests to exclose, bait becomes spoiled quickly in the summer heat, and dens must be monitored for activity.

An increase in biological monitoring would also divert Natural Resources operational resources, as staff would incorporate more detailed monitoring of state-listed species such as least tern, common tern, horseshoe crab, seabeach knotweed, and seabeach evening primrose into the existing monitoring program. More time and effort would be required to monitor predation losses and productivity of all beach nesting birds, not just piping plover. If the NPS is not able to hire additional seasonal staff, Alternative B would result in a long-term diversion of Natural Resources division resources, negatively impacting the programs from which the resources are diverted. The cumulative impacts of Alternative B are likely to be moderate and long-term because recent declines in NPS funding have already resulted in staffing and program limitations.

Impairment Statement

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the Park's establishing legislation, 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park, or 3) identified as a goal in the Park's General Management Plan or other relevant NPS planning documents, there would be no impairment of Park resources or values related to Alternative B.

Conclusion

The Preferred Alternative should affect Special Status Species positively overall due to the predicted increase in productivity with reduced predation and human disturbance. Cumulative impacts to Special Status Species are expected to be moderate and long-term. Impacts to targeted predator species would be minor and short-term and long-term to individuals and negligible to populations; cumulative impacts would be minor to moderate and long-term.

Impacts to other plants and wildlife and to wetlands would be positive overall, minor to moderate, and short-term and long-term, and cumulative impacts would be minor and long-term.

Impacts to recreational opportunities would be minor and long-term, including cumulative impacts; bird watching and environmental education opportunities are expected to increase overall. Anticipated impacts to human safety would be short-term and negligible to minor, and cumulative impacts would be negligible. Impacts to the ability of visitors to enjoy the Park's wildlife would be negligible to minor and short-term to long-term; cumulative impacts would be minor and long-term. Impacts to Park Operations, including cumulative impacts, would be moderate and long-term. Socioeconomic impacts are anticipated to be negligible to minor and short and long-term with the increased costs of Park Operations. No impairment of Park resources or values is expected.

Alternative C: Shoreside Community Protection Plan

Effects on Natural Resources of the Shoreside Ecosystem

Special Status Species

Alternative C has the potential for overall beneficial impacts to federally- or state-listed terrestrial species of concern, including piping plover, least tern, common tern, Northeastern beach tiger beetle, seabeach amaranth, and seabeach knotweed. No effects are anticipated for the aquatic marine mammals or sea turtles (Table 1). The Park would continue to protect Special Status Species by implementing measures specified in its 1992 *Management Plan for the Threatened Piping Plover*, the 2000 *Osprey Management Plan*, and the non-discretionary conservation measures, Reasonable and Prudent Measures, and Terms and Conditions of the four existing Biological Opinions with the USFWS.

Potential Beneficial Effects of Alternative C on Special Status Species

Alternative C would include all of the beneficial impacts anticipated from Alternative B, but would increase their intensity and duration. The aggressive Integrated Predation Management Program would result in major, long-term benefits to Special Status Species that are suffering low biological productivity as a result of predation losses. The biological productivity of piping plover, least tern, common tern, American oystercatcher and Northern diamondback terrapin is expected to significantly improve with a minimization (to the extent feasible) of predator populations at the Park. Black skimmers may return to Sandy Hook to nest, resulting in moderate, long-term benefits to that species.

The closure of public beaches north of North Beach and restricted access to Fisherman's Trail to minimize human disturbance to those areas is expected to provide minor to moderate, long-term benefits to piping plover, least tern, common tern, Northeastern beach tiger beetle and seabeach amaranth. Depending on whether seabeach knotweed and seabeach evening primrose occur within existing and expanded protected areas, minor to moderate, short-term benefits would be

provided for these plants. Since both are perennial species, and the protected areas are seasonal closures, the benefits would be short-term during the growing and flowering season.

The bayside surveys for Special Status Species would generate valuable scientific data on the presence and habitat use of areas at Sandy Hook where scientific data is currently lacking. As scientific data became available, the NPS would adaptively manage the bayside accordingly, which would benefit Special Status Species in the long-term.

Potential Adverse Effects of Alternative C on Special Status Species

Alternative C could generate minor, short-term adverse impacts to those Special Status Species that reside within Sandy Hook year-round. Protected areas would only be closed during the highly productive summer months, resulting in potential adverse impacts from human and pet disturbance during the remaining months of the year. Northeastern beach tiger beetles, Northern diamondback terrapin, seabeach evening primrose and seabeach knotweed, where they are present within the Park, occur year-round. Although these species may hibernate or be dormant during the winter months, they may be adversely impacted by construction activities, human and pet disturbance, or ORV use during those periods.

Appendix G (Table G-3) summarizes the potential impacts to each Special Status Species from Alternative C.

Cumulative Impacts

Although Alternative C could generate significant positive impacts to most Special Status Species, a variety of historic, on-going and planned activities would continue to affect these species. The No Action Alternative is anticipated to result in moderate, long term adverse impacts to Special Status Species in New Jersey, and Alternative C would reduce the intensity of cumulative impacts within the Park by minimizing the localized threats of human disturbance, predation losses and potentially habitat availability. To the degree that biological productivity, numbers and diversity of Special Status Species is improved, positive cumulative impacts to the statewide and rangewide populations of these species may occur, resulting in moderate to major, long-term impacts.

Conclusion

Alternative C is not likely to adversely affect any of the Special Status Species, and is expected to result in moderate to major benefits to piping plover, least tern, common tern, American oystercatcher, and Northern diamondback terrapin. Minor to moderate benefits are anticipated for American bittern, red knot, black rail, black-crowned and yellow-crowned night heron, osprey, bald eagle, roseate tern, Northeastern beach tiger beetle, seabeach amaranth, seabeach evening primrose and seabeach knotweed. If black skimmer return to the Park to nest with the significant reduction in predator and human disturbance threats, moderate benefits would be expected for this species. Northern diamondback terrapin, Northeastern beach tiger beetle, seabeach evening primrose and seabeach knotweed may have minor, short-term adverse impacts during the off-season months from human disturbance if the protected areas are open to

recreational use but would otherwise receive positive benefits from reduced predation and human disturbance.

Targeted predator species

Alternative C proposes to implement an Integrated Predation Management Program that would target certain predator species that are causing losses of beach nesting birds, Northern diamondback terrapin, and their nests and young. An increase in the use of lethal control methods is expected in order to achieve the management goals of this alternative, generating a moderate and long-term impact to targeted predator species as populations are minimized to the extent feasible throughout the Park.

USDA (2004) evaluated the impacts of lethal wildlife management of raccoons, opossum, skunk, red fox and several other mammal species. This impact analysis is herein incorporated by reference; it concluded that based on oversight (of these targeted predator species as game species) by the NJDEP Division of Fish and Wildlife, the limited take of each species, and increasing or stable statewide populations of raccoons, opossum, skunk, and red fox, impacts to local and statewide populations of these species would be minor. USDA (2005) found that the populations and range of many key avian predators (e.g., gulls) have expanded, and that lethal wildlife management of targeted avian predators is not likely to negatively affect these species so long as population levels remain elevated above those recommended by managing authorities; this impact analysis is also herein incorporated by reference.

The issue of humaneness and animal welfare as it relates to the capturing or killing of wildlife for damage management in NJ was evaluated by USDA (2004). The USDA (2004) impact analysis on this topic is herein incorporated by reference. The analysis concluded that the control of mammals causing damages to natural resources, private property, etc., with lethal means could result in “a certain amount of animal suffering” given the current range of technology and resources (USDA 2004, p. 31). New Jersey Wildlife Services and any authorized NPS personnel are experienced and professional in their use of predation management methods so that they are humane within the constraints of current technology and resources; standard operating procedures and mitigation measures are used to maximize humaneness as described in USDA (2004). The AVMA has also reviewed methods of humanely euthanizing animals, and has provided a report on the methods acceptable for different animals (AVMA 2001). The proposed Integrated Predation Management Program would use methods approved by the USDA and AVMA, and as a result, the impacts to animal welfare are anticipated to be minor and short-term.

The impacts of Alternative C, in combination with the impacts of Alternative A (No Action), would result in moderate, long-term cumulative impacts to targeted predator species in the Park since the existing and proposed management actions would attempt to minimize predator populations, but these impacts would be localized to Sandy Hook.

Other plant and wildlife species

Under Alternative C, impacts to other plant and wildlife species are expected to be the same as those described for Alternative B (positive, minor to moderate, and short and long-term) as a major reduction in predation, reduced human disturbance, and expanded protection areas result in increased ecological productivity, species numbers and diversity. The impacts of Alternative C, in combination with the impacts of Alternative A (No Action), would result in positive, minor, and long-term cumulative impacts to other plant and wildlife species since the existing and proposed management actions benefit entire ecosystems.

Wetlands

Under Alternative C, no impacts are expected to wetlands, as no action would be taken which would cause impacts. In the event that the NPS determines that habitat restoration is appropriate to aid the recovery of Special Status Species, potential impacts to wetlands would be the same as those described for Alternative B (positive overall, minor to moderate in intensity, and short-term and long-term in duration). The impacts of Alternative B, in combination with the impacts of Alternative A (No Action), would result in minor, long-term cumulative impacts to wetlands since the majority of the bayside shoreline is already stabilized, degrading or eliminating intertidal wetland habitat along 65% of the bayside shoreline.

Effects on Visitor Experience

Recreation opportunities

Impacts to visitor use in terms of recreational opportunities at Sandy Hook would be moderate and long-term since the northern beaches would be closed to recreational use during the summer months, when visitor use of the Park is highest. Areas closed to recreational use during the summer months would increase on the oceanside by roughly 4% (Fig. 4). The restricted access to Fisherman's Trail during the shorebird and waterbird nesting season would reduce recreational opportunities for fishermen and others who have traditionally used this long stretch of public beach. Combined with the impacts of Action A (No Action), the cumulative impacts of Alternative C on recreation opportunities would be moderate given that large areas of Sandy Hook are already closed to Park visitors, and long-term since seasonal closures occur every year.

Safety

USDA (2004) evaluated the impacts to human safety from an integrated wildlife damage management program that uses non-lethal and lethal means to control target mammal species, and USDA (2003) did the same for the control of target bird species. These impact evaluations are herein incorporated by reference, since Alternative C proposes to utilize these approved predation management techniques, and possibly use APHIS Wildlife Services (WS) professionals to implement them at Sandy Hook. The USDA evaluations determined that the use of chemical predation management techniques poses no risk to public safety and health if they are applied according to label instructions (USDA 2003, 2004). Therefore the impacts to human

health and safety from the use of chemical predation management techniques is expected to be negligible.

The potential use of drugs in the capturing, sedating, handling and euthanizing target predator species was evaluated by USDA (2004) and found to result in no significant harmful impacts to human health if proper standard operating procedures and mitigation measures are used.

To ensure safe use and awareness, NPS or WS employees who use firearms to conduct official duties such as lethal predation management are required to attend approved firearms safety and use training programs. As a result, the expected impacts to human safety from the potential use of firearms during predation management activities is negligible.

Alternative C would implement an aggressive predation management program that would reduce predator populations with lethal means, which is anticipated to generate a minor and short-term threat to human safety. The safety risk to Park staff or contractors would be minimized by the use of certified professionals. Visitors may risk stumbling across traps left for predators if they depart from existing trails and pathways in the Park. The risk to visitors from lethal control measures would be minimized by conducting those activities outside of high visitor use periods (e.g., the late winter and early spring months) and away from areas used by the public. The impacts would be short-term because the trapping and removal activities are likely to be conducted over the span of a few months each year. The cumulative impacts of the above actions on human safety would be negligible due to the highly localized and controlled nature of the predation management activities.

Changes in ability to enjoy wildlife

Visitors would both lose and gain opportunities to enjoy the wildlife of Sandy Hook under Alternative C. The losses would be minor at USCG and North Beach since visitor use of those areas is already low relative to other beaches in the Park. Opportunities to enjoy the wildlife in these areas outside of the nesting season would remain unchanged. Visitors would lose the ability to enjoy wildlife such as red fox, raccoons and other predators as their populations are reduced in the long-term. On the other hand, wildlife populations of Special Status Species are expected to increase significantly under the implementation of Alternative C, affording visitors a gain in opportunities to enjoy the Park's wildlife resources; this gain is expected to be short-term and minor, however, since the majority of the wildlife would be located in protected areas with restricted visitor use. The impacts of Alternative C, in combination with the impacts of Alternative A (No Action), would result in a moderate, long-term cumulative impact to visitors' ability to enjoy Sandy Hook's wildlife since large portions of the Park's shoreside areas would be closed to visitor use during periods of peak biological productivity.

Socioeconomics

Alternative C could lead to a minor impact to the revenue generated from visitor admissions and concessions since visitation would be restricted at northern beaches of the Park. These new restrictions could result in visitors deciding not to visit Sandy Hook, but it could also lead to higher visitation by ecotourists wishing to enjoy the enhanced and protected Special Status

Species in the Park. Impacts are likely to be short-term, as visitation is currently restricted during peak summer weekends by the number of parking spots available in the Park, which is not subject to change under this alternative. Any visitors who decide to travel to substitute destinations are thus likely to be replaced by visitors who previously had to wait to gain admittance to the Park during peak periods. Cumulative impacts are expected to be moderate and long-term due to the higher costs of Park Operations during a period of limited funding.

Park Operations

The expected impacts from Alternative C on Park Operations would be moderate and long-term. The aggressive Integrated Predation Management program would increase operational costs at the Park as the NPS would either contract with professionals to trap and remove predators or divert Natural Resources staff resources and purchase additional equipment to conduct the predation management. During the initial period of time to eliminate (to the extent feasible) predator populations, a reallocation in Park programs would be necessary as Natural Resources staff would devote time and resources to minimizing the predator population(s) instead of conducting other activities like outreach and education. Live trapping to remove fox is very time consuming if it is necessary for NPS staff to spend a lot of time looking for bird nests to exclose, bait becomes spoiled quickly in the summer heat, and dens must be monitored for activity. Operational efficiencies may improve over time as predator populations are reduced, allowing staff to spend less time looking for predators and possibly reduce the number of exclosures needed to protect bird nests.

An increase in biological monitoring would also divert Natural Resources operational resources, as staff would incorporate more detailed monitoring of bayside areas and of state-listed species such as least tern, common tern, horseshoe crab, seabeach knotweed, and seabeach evening primrose into the existing monitoring program. More time and effort would be required to monitor predation losses and productivity of all beach nesting birds, not just piping plover. An increase in seasonal staff and an increase in law enforcement effort also are proposed under Alternative C. If the NPS is not able to hire additional staff to handle these predation management and monitoring responsibilities, Alternative C would result in a long-term diversion of Natural Resources staff resources, negatively impacting the programs from which the resources are diverted such as non-native species control or habitat restoration in non-shoreside areas. The cumulative impacts of Alternative C are likely to be major and long-term because recent declines in NPS funding have already resulted in staffing and program limitations.

Impairment Statement

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the Park's establishing legislation, 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park, or 3) identified as a goal in the Park's General Management Plan or other relevant NPS planning documents, there would be no impairment of Park resources or values related to Alternative C.

Conclusion

Alternative C is not likely to adversely affect any of the Special Status Species, and is expected to result in minor, moderate or major benefits to all of the species of concern; minor, short-term adverse impacts could result from human disturbance to resident species during periods when protected areas are open to recreational use. Cumulative impacts to Special Status Species are expected to be positive, moderate to major, and long-term. Impacts to targeted predator species would be moderate and long-term; cumulative impacts would be moderate and long-term as local predator populations are reduced. Other plant and wildlife impacts would be positive overall, minor to moderate, and short and long-term, and cumulative impacts would be positive, minor and long-term. Wetland impacts could be positive overall, minor to moderate, and short-term and long-term; cumulative impacts to wetlands would be minor and long-term.

Impacts to recreational opportunities would be moderate and long-term; cumulative impacts would be major and long-term. Anticipated impacts to human safety would be short-term and negligible to minor, and cumulative impacts would be negligible. Impacts to the ability of visitors to enjoy the Park's wildlife would be positive and negative, minor to moderate and short-term and long-term; cumulative impacts would be moderate and long-term. Impacts to Park Operations would be moderate and long-term; cumulative impacts would be major and long-term. Socioeconomic impacts would be both positive and negative, minor and short-term; cumulative impacts would be moderate and long-term. No impairment of Park resources or values is expected.

V. CONSULTATION AND COORDINATION

The following agencies were contacted and/or consulted during preparation of this EA:

U.S. Fish and Wildlife Service, New Jersey Field Office (USFWS). The NPS informally consulted the Ecological Services Field Office (Annette Scherer, Wendy Walsh) on threatened and endangered species in New Jersey, existing informal and formal consultations under the Endangered Species Act for Sandy Hook, and recommendations on the content and format of the shoreside threatened and endangered species management plan. Each of the Recovery Coordinators (Anne Hecht, Dale Suiter, Mike Drummond) for the three federally-listed species were also contacted for current status and distribution data and recovery plans. On June 27, 2006, the NPS met with the USFWS and other resource and regulatory agencies to solicit scoping comments on the issues that should be addressed by the updated management plan. USFWS staff corresponded and met with NPS staff and its contractors to discuss various aspects of this project throughout its development. The NPS obtained additional information concerning threatened and endangered species and existing bird conservation plans in the project area from a variety of Internet sites, including sites posted by the USFWS, NJDEP, U.S. Geological Survey's Biological Resources Division, Partners In Flight, Audubon, and the Mid-Atlantic/New England Maritime Regional Working Group for Waterbirds. The NPS has submitted a copy of this EA to the USFWS and requested concurrence with the NPS's determination that the proposed action is not likely to adversely affect the Piping Plover, seabeach amaranth and Northeastern beach tiger beetle.

New Jersey Department of Environmental Protection, Land Use Regulation Program (NJDEP/LURP). The NPS contacted the NJDEP/LURP to discuss compliance with the Coastal Zone Management Act, as well as state laws and regulations. The NPS obtained additional information, including New Jersey's Coastal Zone Management Plan, from NJDEP/LURP's Internet site at '<http://www.state.nj.us/dep/landuse/coast/coast.html>'. The Park has submitted a copy of this EA and requested concurrence with the NPS's determination that the proposed action is consistent with New Jersey's Coastal Zone Management in accordance with the Coastal Zone Management Act.

New Jersey Department of Environmental Protection (NJDEP). The NPS contacted the Endangered and Non-game Species Program (Dave Jenkins and Todd Pover) on endangered and threatened species issues of concern to the state. On June 27, 2006, the NPS met with the NJDEP and other resource and regulatory agencies to solicit scoping comments on the issues that should be addressed by the updated management plan. NJDEP staff corresponded and met with NPS staff and its contractors to discuss various aspects of this project throughout its development. The NPS obtained additional information concerning threatened and endangered species and the New Jersey Wildlife Action Plan from a variety of NJDEP Internet sites. The NPS has submitted a copy of this EA to the NJDEP for review and comment.

National Oceanic and Atmospheric Administration (NOAA) Fisheries Service (aka National Marine Fisheries Service (NMFS)). The NPS contacted NOAA Fisheries on endangered and threatened species in New Jersey and issues of concern to the agency. NOAA Fisheries staff (Karen Greene) was invited to attend a June 27, 2006, interagency scoping

meeting hosted by the NPS to identify issues that should be addressed by the updated management plan. The NPS obtained additional information concerning threatened and endangered marine species and their Recovery Plans from a variety of NOAA Internet sites. The NPS has submitted a copy of this EA to NOAA Fisheries Service for review and comment.

U.S. Army Corps of Engineers, New York District (USACE). The NPS contacted the Environmental Branch of the New York District of the USACE (Mark Burlas) on beach and sediment management issues of concern to the USACE. On June 27, 2006, the NPS met with the USACE and other resource and regulatory agencies to solicit scoping comments on the issues that should be addressed by the updated management plan. The NPS obtained additional information concerning USACE projects adjacent to the Park (i.e., Sandy Hook navigational channel, Sea Bright seawall, Sea Bright to Manasquan Beach Erosion Control Project) from USACE staff and a variety of USACE Internet sites. The NPS has submitted a copy of this EA to the USACE for review and comment.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (USDA/APHIS-WS). The NPS contacted the APHIS division of the USDA (Janet Bucknall, Chris Boggs) for information on predation management options as well as the predation management partnership and their development of best management practices for controlling predation of beach nesting birds in New Jersey. The NPS and its contractors for this EA attended the May 10, 2006, meeting of the predation management partnership to obtain technical information and background materials on predation management issues and options in coastal New Jersey. On June 27, 2006, the NPS met with the APHIS and other resource and regulatory agencies to solicit scoping comments on the issues that should be addressed by the updated management plan. The NPS obtained additional information concerning existing APHIS predation management programs (and accompanying NEPA documents) for beach nesting birds and other fauna in New Jersey and Virginia from APHIS staff and a variety of Internet sites. The NPS has submitted a copy of this EA to APHIS for review and comment.

In addition, the following agencies and organizations (and others) will be provided a copy of this Environmental Assessment for their review and comment:

Federal Agencies

National Oceanic and Atmospheric Administration, National Marine Fisheries Service
National Oceanic and Atmospheric Administration, Northeast Fisheries Center
National Oceanic and Atmospheric Administration, Coastal Ecology Branch
US Army Corps of Engineers, New York District
US Coast Guard
US Department of Agriculture, APHIS Wildlife Services
US Environmental Protection Agency
US Fish and Wildlife Service, New Jersey Ecological Services Field Office
US Congress – House of Representatives
US Congress – Senate

State Agencies

New Jersey Department of Environmental Protection, Coastal Management Program
New Jersey Department of Environmental Protection, Division of Fish and Wildlife
New Jersey Department of Environmental Protection, Land Use Regulation Program
New Jersey Department of Transportation
New Jersey State Historic Preservation Office
New Jersey General Assembly
New Jersey Office of the Governor

Local Agencies

Borough of Highlands
Borough of Sea Bright
Middletown Township
Middletown Township Environmental Commission
Middletown Township Planning Board
Monmouth Beach Borough
Monmouth County Board of Chosen Freeholders
Monmouth County Planning Board
Monmouth County Vocational Schools, Marine Academy of Science and Technology

Citizens Groups

American Littoral Society
Asbury Park Fishing Club
Brookdale Community College, Ocean Institute at Sandy Hook
Clean Ocean Action
Friends of Gunnison
HS Concessions
Monmouth County Audubon
National Parks and Conservation Association, New York Region
New Jersey Audubon Society
New Jersey Coastal Heritage Trail
New Jersey Lighthouse Society
New Jersey Marine Sciences Consortium
New Jersey Sailing Center Foundation
New Jersey Environmental Federation
New Jersey Sierra Club
Rutgers University, Center for Coastal Studies
Sandy Hook Bird Observatory
Sandy Hook Foundation, Inc.
Sandy Hook Partners
Save Sandy Hook
Surfers Environmental Alliance

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VII. REFERENCES

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EXPLANATION OF ACRONYMS

APHIS	Animal and Plant Health Inspection Services, U.S. Department of Agriculture
ATV	All-terrain vehicle
AVMA	American Veterinary Medical Association
CBRA	Coastal Barrier Resources Act
CFR	Code of Federal Regulations
cm	Centimeter
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DDE	1,1-dichloro-2,2-bis(<i>p</i> -chlorophenyl)ethylene, a breakdown product of DDT
DDT	The pesticide 1,1,1-trichloro-2,2-bis(<i>p</i> -chlorophenyl)ethane
DO	Director's Order
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ENSP	Endangered and Nongame Species Program, New Jersey Department of Environmental Protection
ESA	Endangered Species Act of 1973
ft	Feet
FOIA	Freedom of Information Act
in	Inch
GIS	Geographic Information System
GMP	General Management Plan
GRA	Geographic Recovery Area
m	Meter
MBTA	Migratory Bird Treaty Act
NAWCA	North American Wetland Conservation Act
NEES & WDTC	Northeast Endangered Species and Wildlife Diversity Technical Committee
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NJDEP	New Jersey Department of Environmental Protection
NJDEP / LURP	New Jersey Department of Environmental Protection, Land Use Regulation Program
NJDOT	New Jersey Department of Transportation
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRA	National Recreation Area
NWR	National Wildlife Refuge
NYDEC	New York Department of Environmental Conservation
OPA	Otherwise Protected Area

ORV	Off-road vehicle
PCB	Polychlorinated Biphenyls
PEPC	Planning Environment and Public Comment
RPM	Reasonable and Prudent Measure
SPCA	Society for the Prevention of Cruelty to Animals
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WS	Wildlife Services, a division of the Animal and Plant Health Inspection Services, U.S. Department of Agriculture

VIII. APPENDICES