United States Department of the Interior

FISH AND WILDLIFE SERVICE

In Reply Refer to:

ES-02/820

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DEC 2 7 2005

Lt. Colonel Robert J. Ruch
District Engineer, Philadelphia District
U.S. Army Corps of Engineers
Wanamaker Building
100 Penn Square East
Philadelphia, Pennsylvania 19107-3390
(Attn: Minas M. Arabatzis)

Dear Lt. Colonel Ruch:

This letter transmits the U.S. Fish and Wildlife Service's (Service) final programmatic Biological Opinion, in accordance with Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA), on the effects of beach nourishment, renourishment, stabilization, and restoration projects funded, permitted, or conducted by the U.S. Army Corps of Engineers, Philadelphia District (Corps) along the Atlantic Coast of New Jersey on the federally listed (threatened) species piping plover (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*).

During previous consultations on Corps shoreline stabilization actions, the Service and the Corps recognized that many of the endangered species issues encountered were very similar from project to project. Consequently, the Service and the Corps determined that a programmatic approach to the consultation process was appropriate and that completion of a programmatic consultation would streamline and expedite consultation on individual actions carried out by the Corps' Philadelphia District. To ensure the protection of federally listed species, the Corps developed programmatic conservation measures that will be incorporated into future projects implemented or permitted within the Corps' Philadelphia District Program Area.

Programmatic consultations involve a two-tiered approach: Tier 1 consists of the programmatic consultation on the overall agency program while Tier 2 involves streamlined consultations on individual actions carried out under a program. This programmatic Biological Opinion serves as the Tier 1 consultation and encompasses the Corps overall program of beach nourishment / renourishment for nine federally sponsored projects under the New Jersey Shore Protection

Study within the Philadelphia District; repair and replacement of three existing hard stabilization structures; three active Corps permits for beachfill activities issued under Section 10 of the Rivers and Harbors Appropriation Act of 1899 (30 Stat. 1151, as amended; 33 U.S.C. 403 *et seq*.) and Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1344 *et seq*.); and routine operations, maintenance, and survey work undertaken by the Corps related to existing, operational Corps projects, hereafter referenced as the Corps Program.

Except for projects involving the repair and replacement of three hard stabilization structures, as specifically described within this document, this programmatic Biological Opinion does not include consultation on the potential impacts to federally listed species from construction of new hard structures (*e.g.*, jetties, groins, seawalls, bulkheads, revetments) or realignment or major repairs of existing hard structures. Separate consultation with the Service will be required for construction or major maintenance of hard structures that may affect any federally listed species. Additionally, this programmatic Biological Opinion does not include a Department of the Army State Programmatic General Permit (SPGP-24) for beach maintenance activities that is currently under consideration by the Corps. The Service and the Corps will continue to work cooperatively on development of this SPGP and will initiate consultation as necessary once sufficient permit details are available to allow an assessment of potential impacts to federally listed species.

Individual Corps projects or actions carried out under the Corps Program must continue to undergo individual (Tier 2) consultation to ensure consistency with programmatic conservation measures outlined within the Corps Program description and the reasonable and prudent measures and terms and conditions of this programmatic Biological Opinion. In addition, project-specific information for individual actions carried out under the Corps Program will be evaluated by the Service to ensure the assumptions regarding Program effects to federally listed species were correct and that the level of take anticipated within the Incidental Take Statement included within the Biological Opinion is not exceeded.

With respect to ESA compliance, all aspects of the Corps Program description in the Service's Biological Opinion will be binding, including the specific nature, timing, and extent of proposed beach nourishment and stabilization activities, as well as all conservation measures proposed by the Corps to protect listed species. Reasonable and prudent measures and the accompanying terms and conditions provided within the enclosed Biological Opinion are nondiscretionary and are designed to minimize incidental take of piping plovers anticipated as a result of the Corps Program. In order to be exempt from the prohibitions of Section 9 of the ESA, the Corps must comply with the terms and conditions in the Biological Opinion, which implement the reasonable and prudent measures.

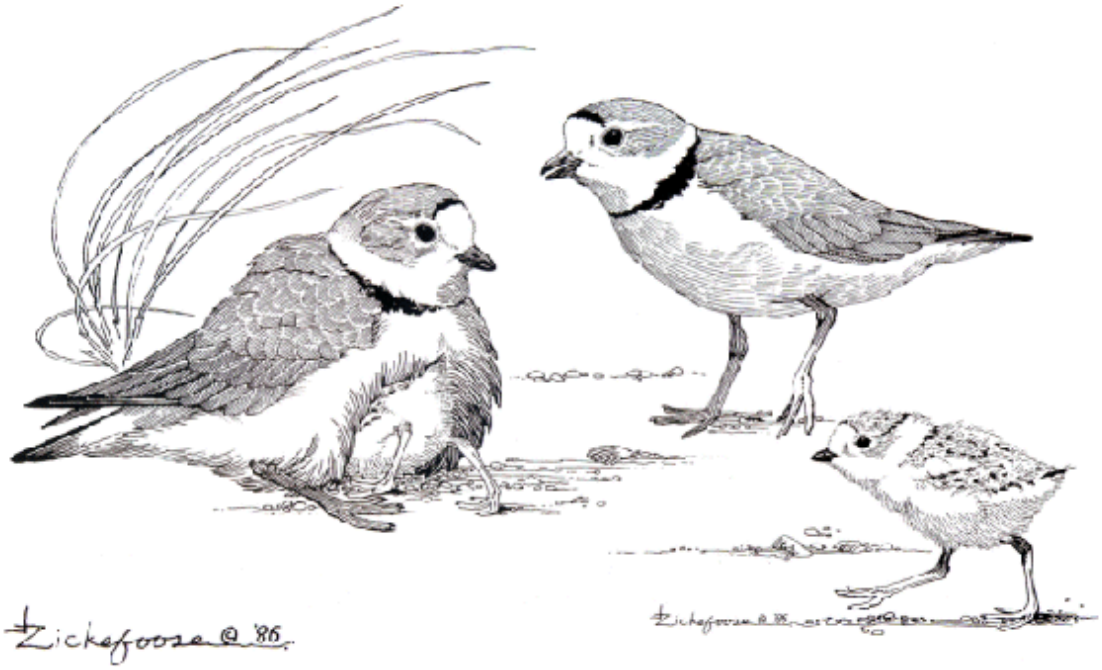
The Service appreciates your ongoing commitment to protection of federally listed species. If you have any questions or concerns regarding this consultation, please contact John C. Staples or Annette M. Scherer of my staff at (609) 646-9310, extensions 12 and 34, respectively.

Sincerely,

Clifford G. Day
Supervisor

Enclosure

BIOLOGICAL OPINION ON THE EFFECTS OF FEDERAL BEACH NOURISHMENT ACTIVITIES ALONG THE ATLANTIC COAST OF NEW JERSEY WITHIN THE U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT ON THE PIPING PLOVER (*Charadrius melodus*) AND SEABEACH AMARANTH (*Amaranthus pumilus*)



Prepared by:

U.S. Fish and Wildlife Service
New Jersey Field Office
Ecological Services
Pleasantville, New Jersey 08232

December 2005

BIOLOGICAL OPINION ON THE EFFECTS OF FEDERAL BEACH NOURISHMENT ACTIVITIES ALONG THE ATLANTIC COAST OF NEW JERSEY WITHIN THE U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT ON THE PIPING PLOVER (*Charadrius melodus*) AND SEABEACH AMARANTH (*Amaranthus pumilus*)

Prepared for:

U.S. Army Corps of Engineers
Philadelphia District
Philadelphia, Pennsylvania 19107-3390

Prepared by:

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December 2005

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I. INTRODUCTION

This document represents the U.S. Fish and Wildlife Service's (Service) programmatic Biological Opinion, in accordance with Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (ESA), on the effects of beach nourishment, renourishment, stabilization, and restoration projects funded, permitted, or conducted by the U.S. Army Corps of Engineers, Philadelphia District (Corps) along the Atlantic Coast of New Jersey on the federally listed (threatened) species piping plover (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Definitions of selected terminology used within this Biological Opinion are provided within Appendix A.

During previous consultations on Corps shoreline stabilization actions, the Service and the Corps recognized that many of the endangered species issues encountered were very similar from project to project. Consequently, the Service and the Corps determined that a programmatic approach to the consultation process was appropriate and that completion of a programmatic consultation would streamline and expedite consultation on individual actions carried out by the Corps Philadelphia District. To ensure the protection of federally listed species, the Corps developed programmatic conservation measures to be incorporated into future projects implemented or permitted within the Corps Philadelphia District Program Area.

Programmatic consultations involve a two-tiered approach: Tier 1 consists of the programmatic consultation on the overall agency program while Tier 2 involves streamlined consultations on individual actions carried out under a program. This programmatic Biological Opinion encompasses the Corps overall program of beach nourishment / renourishment for nine federally sponsored projects under the New Jersey Shore Protection Study within the Philadelphia District; repair and replacement of three existing hard stabilization structures; three active Corps permits for beachfill activities issued under Section 10 of the Rivers and Harbors Appropriation Act of 1899 (30 Stat. 1151, as amended; 33 U.S.C. 403 *et seq*.) and Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1344 *et seq*.); and operations, maintenance, and survey work undertaken by the Corps related to existing, operational Corps projects, hereafter referenced as the Corps Program. Except for projects involving the repair and replacement of three hard stabilization structures, as specifically described within this document, this programmatic Biological Opinion does not include consultation on the potential impacts to federally listed species from construction of new hard structures (*e.g.*, jetties, groins, seawalls, bulkheads, revetments) or realignment or repairs of existing hard structures. Separate consultation with the Service will be required for construction or maintenance of hard structures that may affect any federally listed species.

Additionally, this programmatic Biological Opinion does not include a Department of the Army State Programmatic General Permit (SPGP-24) for beach maintenance activities that is currently under consideration by the Corps. The Service and the Corps will continue to work cooperatively on development of this SPGP and will initiate consultation as necessary once sufficient permit details are available to allow an assessment of potential impacts to federally listed species.

The roseate tern (*Sterna dougallii dougallii*), a federally listed endangered species, is occasionally observed in New Jersey during the breeding season within the Corps Program Area. The species is considered transient in New Jersey and no recent nesting activity of roseate terns has been documented within the State. However, the roseate tern could potentially nest sporadically within the Program Area during the life of the Program. Additionally, the federally listed (threatened) northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) once occurred within New Jersey from Sandy Hook to Holgate. By the late 1970s the species was extirpated from its historic range in New Jersey. Recovery efforts are underway to restore the northeastern beach tiger beetle to its former range within the State. To date, all re-established populations of the northeastern beach tiger beetle in New Jersey are located in northern coastal sites outside of the Philadelphia District's jurisdiction. However, two suitable sites for future beetle reintroduction efforts are located within the Program Area and beetles from reintroduced sites may disperse and colonize additional suitable sites. Therefore, the northeastern beach tiger beetle may become re-established within the Program Area during the life of the Program.

No Critical Habitat for either the roseate tern or northeastern beach tiger beetle has been designated in New Jersey. Neither species is currently extant within the Program Area and the Corps Program does not include habitat alteration within areas identified as potential reintroduction sites for the northeastern beach tiger beetle; therefore, this Biological Opinion does not address the impacts of the Corps Program on either species. Should either the roseate tern or northeastern beach tiger beetle become established within the Philadelphia District's Program Area and be likely adversely affected by Corps Program activities, reinitiation of formal consultation will be required and this Biological Opinion will be appended to address potential impacts to the species from the Corps Program.

The piping plover currently nests in multiple locations throughout the Program Area. Additionally, Corps nourishment and restoration activities can be expected to create beach and dune habitats that may attract nesting piping plovers within areas that have not been recently or historically used by plovers. It is reasonably expected that some or all of these newly created habitats will be occupied by piping plovers over the remainder of the 50-year life of the Corps Program. After an absence of 87 years, seabeach amaranth is once again found on New Jersey's Atlantic coastal beaches. While the largest New Jersey amaranth populations are located on the northern portion of the State's coastline, outside of the Philadelphia District's jurisdiction, several small colonies have been documented within the Program Area. Natural colonization of additional suitable habitat within the southern portion of New Jersey is likely over the life of the Corps Program. As with plovers, the Corps nourishment and restoration activities can be reasonably expected to create additional beach habitats that may be colonized by seabeach amaranth in future years.

To ensure the protection of federally listed species, the Corps proposes to incorporate conservation measures for the protection of both the piping plover and seabeach amaranth into the project design of individual projects funded, permitted, or conducted by the Corps under its Program. For the purposes of this programmatic consultation, the Service evaluated the Corps overall Program with the conservation measures proposed by the Corps to minimize or avoid adverse impacts to piping plover and seabeach amaranth. This Biological Opinion is based on

information provided within the *Philadelphia District, U.S. Army Corps of Engineers, Section 7 Biological Assessment for Potential Impacts to the Piping Plover* (*Charadrius melodus*) *and Seabeach Amaranth* (*Amaranthus pumilus*) *Resulting from Beach Nourishment Projects Along the New Jersey Coast* (Biological Assessment) (U.S. Army Corps of Engineers, 2001a), other information provided by the Corps for Service review, and discussions with the Corps as outlined below. A complete administrative record of this consultation is on file in the Service's Ecological Services, New Jersey Field Office.

The purpose of this programmatic consultation is to expedite review of Corps funded and permitted Program activities. Individual Corps projects or actions carried out under the Corps Program must continue to undergo individual (Tier 2) consultation to ensure consistency with programmatic conservation measures outlined within the Corps Program description and the reasonable and prudent measures and terms and conditions of this programmatic Biological Opinion. In addition, project-specific information for individual actions carried out under the Corps Program will be evaluated by the Service to ensure the assumptions regarding Program effects to federally listed species were correct and that the level of take anticipated within the Incidental Take Statement included within the Biological Opinion is not exceeded. Projects conforming with the protective requirements outlined in the programmatic Biological Opinion will receive expedited review and a follow-up response from the Service.

Individual projects or activities that cannot be designed or carried out to conform to the protective programmatic conservation measures developed by the Corps or projects that will exceed the anticipated level of take described within this programmatic Biological Opinion will require individual Biological Opinions. The Service will re-evaluate this programmatic consultation annually to ensure that its continued application will not result in unacceptable effects on the piping plover or seabeach amaranth.

II. CONSULTATION HISTORY

The Corps Program includes beach nourishment, renourishment, and restoration activities encompassed within the New Jersey Shore Protection Study. Service involvement and review of the New Jersey Shore Protection Study dates back to the early 1990s. The Service provided comments pursuant to the ESA on the Corps draft and final Feasibility Reports / Environmental Impact Statements on individual nourishment projects encompassed by the New Jersey Shore Protection Study and completed several related reports through Scopes of Work with the Corps pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq*.) (FWCA). In addition, pursuant to the FWCA and ESA, the Service reviewed and commented on Corps-issued permits for beachfill activities regulated by the Corps. The Service has also coordinated with the Corps regarding development of an SPGP for beachfill and beach maintenance activities. The consultation history for each of these past projects or permits is contained within the administrative record for the individual Corps action and is not reiterated within this Biological Opinion.

In the early and mid-1990s, the Service began recommending that the Corps prepare Biological Assessments to address potential impacts to nesting piping plovers from individual Corps proposed beach nourishment projects. After reviewing several of the proposed individual nourishment projects encompassed by the New Jersey Shore Protection Study, the Service recognized that the Corps Program was very similar from project to project. Consequently, the Service recommended that the Corps consider a programmatic approach to consultation and prepare a Biological Assessment of all similar federal beach renourishment activities along the Atlantic Coast of New Jersey within the Philadelphia District. Since the late 1990s, the Service has engaged in ongoing consultation with the Corps regarding its beach nourishment program. During informal consultation and following initiation of formal consultation, the Service participated in numerous telephone calls and exchanged additional information with the Corps via electronic mail or facsimile. A chronology of key correspondence and meetings is provided below.

April 10, 2001	The Corps submitted a Biological Assessment to the Service regarding its overall program of beach nourishment, renourishment, restoration, and maintenance within the Philadelphia District. The Biological Assessment addressed potential impacts to piping plover and seabeach amaranth from beach nourishment activities.
October 17, 2001	The Service received the Corps request for formal consultation on the Townsends Inlet to Hereford Inlet beach nourishment and restoration project. To prevent potential project delays, the Corps and the Service agreed to suspend further work on the programmatic consultation so that the Service could first provide the Corps with a Biological Opinion for the Townsends Inlet to Hereford Inlet project.

December 5, 2001	The Service, Corps, and New Jersey Department of Environmental Protection (NJDEP), Division of Fish and Wildlife, Endangered and Nongame Species Program (ENSP) met to discuss the Townsends Inlet to Hereford Inlet project and to refine conservation measures to be incorporated into the Townsends Inlet to Hereford Inlet project and other future Corps nourishment / renourishment projects.
January 3, 2002	By facsimile, the Service provided the Corps with a draft written summary of the conservation measures that would be used for formulation of the Biological Opinion for the Townsends Inlet to Hereford Inlet project and future Corps nourishment / renourishment projects.
January 30, 2002	The Corps provided verbal concurrence regarding the accuracy of the conservation measures.
May 28, 2002	The Service provided the Corps with a draft Biological Opinion for the federal beach nourishment and restoration activities occurring from Townsends Inlet to Hereford Inlet.
June 27, 2002	The Service received the Corps request for formal consultation on the Cape May Inlet to Lower Township beach nourishment. To prevent potential project delays, the Corps and the Service agreed to defer work on the programmatic consultation so that the Service could first provide the Corps with a Biological Opinion for the Cape May Inlet to Lower Township project.
August 14, 2002	The Service received the Corps written comments on the draft Townsends Inlet to Hereford Inlet Biological Opinion.
September 17, 2002	The Service provided the Corps with a draft Biological Opinion for federal beach nourishment activities occurring from Cape May Inlet to Lower Township.
September 20, 2002	The Service provided the Corps with a final Biological Opinion for federal beach nourishment and restoration activities occurring from Townsends Inlet to Hereford Inlet.
December 9, 2002	By electronic mail, the Corps provided comments on the draft Biological Opinion for the Cape May Inlet to Lower Township project.
December 20, 2002	The Service provided the Corps with a final Biological Opinion for the Cape May Inlet to Lower Township project.

February 6, 2003	By telephone, the Corps requested that the Service expedite completion of an individual Biological Opinion on the Lower Cape May Meadows - Cape May Point beach nourishment and restoration project prior to completion of the programmatic Biological Opinion.
February 11, 2003	The Service provided the Corps with a letter agreeing to expedite formal consultation on the Lower Cape May Meadows - Cape May Point project.
March 12, 2003	The Service and the Corps met to discuss the timeline for upcoming Corps nourishment projects and the Service's preparation of the programmatic Biological Opinion. The Corps requested that in addition to nourishment projects and permits, the Service include three seawall projects within the programmatic consultation.
April 2, 2003	The Service provided the Corps with a Biological Opinion for the Lower Cape May Meadows - Cape May Point beach nourishment and restoration project.
April 11, 2003	The Corps provided the Service with a timeline for federally sponsored projects to be constructed or initiated during fiscal years 2003 and 2004.
May 27, 2003	The Service sent the Corps a letter requesting that the Corps clarify what beach nourishment or stabilization was planned for 14 undeveloped coastal and barrier island areas within the Program Area. The Service's letter also requested copies of any specifications, recommendations, or guidelines provided to State or local project sponsors regarding construction and maintenance of dunes on federally sponsored nourishment sites.
June 19, 2003	By electronic mail, the Service requested that the Corps review and provide comments on a draft table summarizing available information regarding current and proposed federal projects within the Program Area.
June 30, 2003	By electronic mail, the Service sent the Corps a draft of the Program description and agreed-upon conservation measures (sections of the programmatic Biological Opinion) for review and concurrence. In addition, the Service noted several items within the Program description and conservation measures where clarification by the Corps was required.
July 1, 2003	By electronic mail, the Corps provided corrections and updated information on the Service's table summarizing available information on federal projects within the Program Area. The Corps also provided additional project details regarding anticipated construction timing for its 3 seawall projects.

July 03, 2003	By electronic mail, the Corps provided additional information regarding the role of the NJDEP as the non-Federal sponsor for federal projects within the Program Area.
July 15, 2003	By electronic mail, the Corps provided concurrence or clarification on the Program description and conservation measure sections of the draft programmatic biological opinion.
July 18, 2003	By electronic mail, the Corps provided the Service with an updated list of active federal permits authorizing beach nourishment activities.
July 24, 2003	By electronic mail, the Corps provided the Service with aerial photographs and brief descriptions of 3 seawall projects (Townsends Inlet Seawall, Hereford Inlet Seawall, and Absecon Inlet Bulkhead and Revetment) to be included in the programmatic consultation.
July 24, 2003	By letter, the Corps provided the Service with clarification regarding beach nourishment or stabilization activities planned for 14 undeveloped coastal and barrier island areas within the Program Area. The Corps letter also provided information regarding standard specifications for dune construction and maintenance for federally sponsored projects.
July 29, 2003	By electronic mail, the Corps provided the Service with additional information regarding active federal permits authorizing beach nourishment activities.
August 7, 2003	The Service and the Corp met at the Townsends Inlet seawall project site to discuss and develop site-specific conservation measures to protect piping plovers nesting adjacent to the project.
August 8, 2003	By electronic mail, the Corps provided the Service with a summary of the conservation measures developed to protect piping plover from construction of the Townsends Inlet seawall.
August 21, 2003	By electronic mail to the Corps, the Service provided comments and suggested clarification regarding the conservation measures specific to the Townsends Inlet seawall, which were agreed upon during the August 7, 2003 site visit.
January 26, 2004	By telephone, the Corps and the Service discussed potential adverse impacts to federally listed species from planting and maintenance of beach and dune vegetation on Corps project areas. The Corps agreed to work cooperatively with the Service and the U.S. Department of Agriculture (USDA) to develop beach and dune planting guidelines for use throughout the Program Area. Additionally, the Corps agreed to modify the Program

	description to include a conservation measure regarding its commitment to development of the beach and dune planting guidelines.
January 29, 2004 to February 2, 2004	By electronic mail, the Service and the Corps worked cooperatively to develop a conservation measure regarding the planting and maintenance of beach and dune vegetation.
March 4, 2004	By electronic mail to the Corps, the Service repeated its request for addition information / further clarification regarding the proposed SPGP and the Corps operations and maintenance activities.
March 30, 2004	By electronic mail to the Service, the Corps provided additional information regarding the types and frequency of operations and maintenance activities that are routinely conducted as part of the Corps Program. Additionally, the Corps dropped the SPGP for beach fill activities from the programmatic consultation pending further consideration of the necessity of pursuing such a permit.
April 8, 2004	By electronic mail, the Corps concurred with a recommendation by the Service that the Sea Isle City and Stone Harbor beach fill permits be removed from the Program description since both permits expired on December 31, 2003.
July 19, 2004	The Service, the Corps, and the ENSP met at the Hereford Inlet seawall project site to discuss and develop site-specific conservation measures to protect piping plovers nesting adjacent to the project site.
September 28, 2004	The Service provided the Corps with a draft non-jeopardy programmatic Biological Opinion on the subject Program.
June 7, 2005	The Service and the Corps met to discuss the draft programmatic Biological Opinion. The Corps provided verbal and written comments on the draft document. The Service and the Corps identified several outstanding concerns that needed clarification.
November 10, 2005	The Service and the Corps met to incorporate needed clarifications into the final document.

III. DESCRIPTION OF THE PROPOSED ACTION

As defined in 50 CFR 402.02, the "action area" to be considered during consultation on an activity or program authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas, is defined as "all areas to be affected directly or indirectly by the federal action, and not merely the immediate area involved in the action." Indirect effects are "those that are caused by the proposed action and are later in time, but are still reasonably certain to occur."

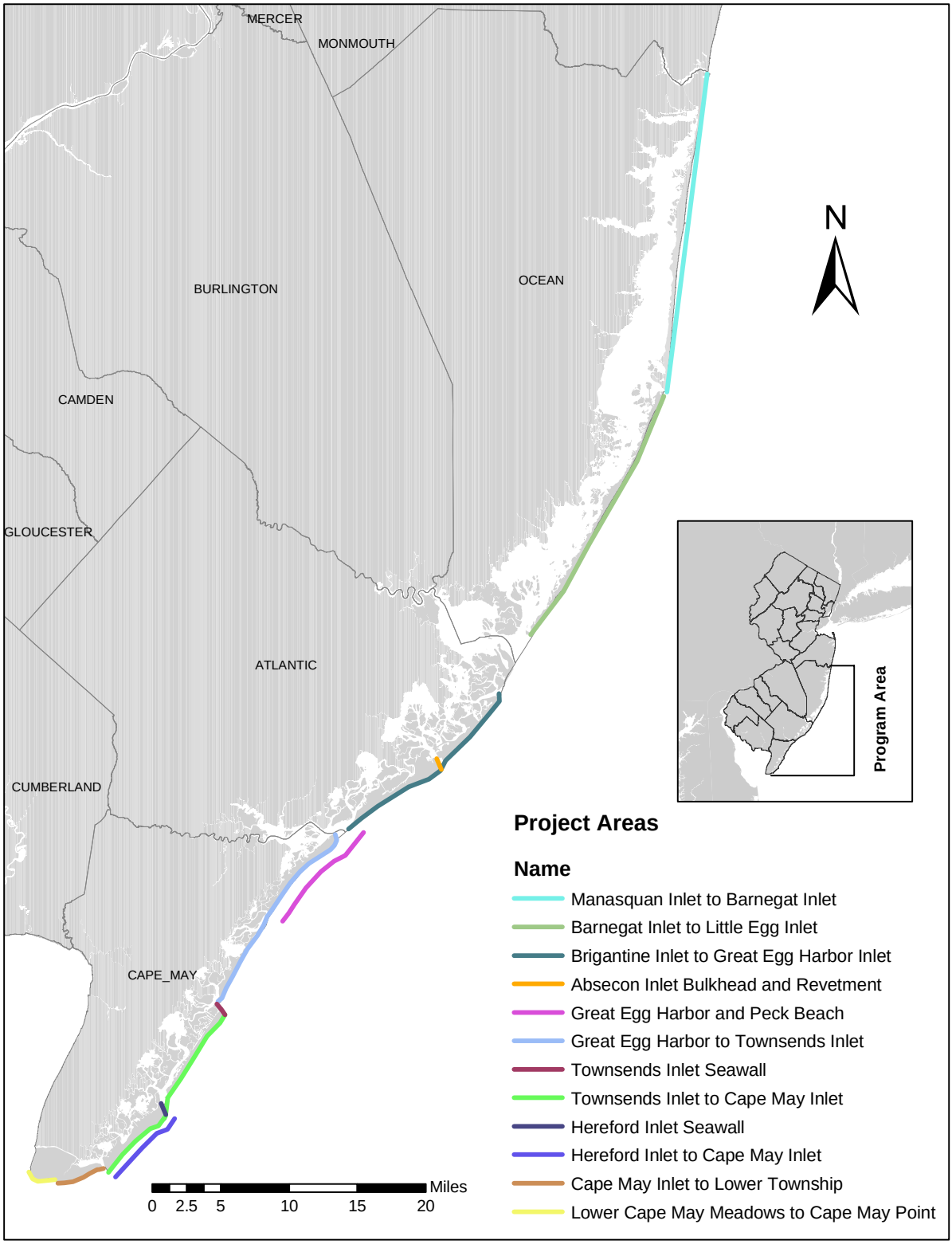
A. OVERVIEW OF THE CORPS PROGRAM AREA

The Program Area encompasses the portion of the Atlantic Coast of New Jersey under the jurisdiction of the Corps Philadelphia District. The area extends from Manasquan Inlet, Ocean County to Cape May Point, Cape May County (Figure 1). Dense residential and commercial development and associated supporting infrastructure has occurred along most of New Jersey's Atlantic coast. Past federal, State, County, Municipal, and private actions, some dating back to the early 1900s, have been undertaken to protect these developments from coastal flooding or erosion. Shore protection efforts have ranged from construction of permanent hard stabilization structures, such as groins, revetments, jetties, bulkheads, and seawalls, to other less permanent stabilization methods such as beach renourishment and dune construction. To further stabilize nourished beaches and constructed dunes, these features have often been augmented through installation of geotubes, placement of sand fencing, and planting of native and non-native vegetation.

The entire Atlantic Coast of New Jersey is characterized by high-energy beaches. The land features of the coastline consist of wave-dominated coastal barrier island beaches, headlands, and spits. A series of dunes, vegetated primarily by American beachgrass (*Ammophila breviligulata*), occurs landward of the beach in some areas along the coast; however, coastal development has removed or displaced many of the existing dunes and disrupted the formation of new dunes (U.S. Army Corps of Engineers, 2001a). The bayside coast of New Jersey's barrier islands is characterized by extensive tidal salt marsh, ocean to bayside overwash zones, and mud flats. Historically, in many developed areas, such salt marsh wetlands, overwash zones, and mud flats were extensively filled and bulkheaded to increase the amount of developable land on low-lying barrier islands and spits. These past fill activities have permanently eliminated nesting and foraging habitat for many coastal avian species, including the piping plover.

Some undeveloped or sparsely developed Atlantic coastal areas do remain in New Jersey within the Philadelphia District. Such areas have been set aside as public or private recreational or conservation lands and often occur at and adjacent to oceanfront inlets. These inlet areas have been historically difficult to stabilize due to their dynamic nature, often undergoing fluctuating cycles of erosion and accretion. Some sparsely developed public areas, such as Island Beach State Park, have been established to provide recreational opportunities and have undergone some minor periodic shoreline stabilization (such as sand fencing, sand transfer to repair dune breaches, and vegetation planting) to protect roads, parking lots, and buildings. Recreational use of Island Beach State Park's coastal beaches is heavy, particularly during the summer months.

Figure 1. U.S. Army Corps of Engineers, Philadelphia District Program Area with Project Areas



Other areas, such as the Holgate and Little Beach Island Units of Edwin B. Forsythe National Wildlife Refuge (NWR), have been set aside as conservation lands and are truly undeveloped, experiencing minimal human disturbance or direct habitat alteration. Since protection of man-made structures is not an issue at these conservation areas, natural coastal processes, such as periodic overwash during storm events have been allowed to occur unabated.

While most undeveloped areas do not contain hard shoreline structures and have not directly received sand during nourishment events, these areas are altered indirectly from adjacent shoreline stabilization practices. Placement of groins and jetties when occurring updrift of undeveloped areas has disrupted natural alongshore transport of sand, effectively starving downdrift beaches and resulting in shoreline retreat and loss of beach and dune habitats. Conversely, nourishment projects occurring updrift of undeveloped areas have increased the alongshore sand transport, often resulting in shoreline advance and an increase of available dune and beach habitats. Overall, past shoreline stabilization practices have substantially altered the character and natural function of New Jersey's oceanfront beaches.

B. PROJECT DESCRIPTIONS

1. Civil Works Projects – Beach Nourishment

Under the civil works planning program, the Corps responds to Congressional authorization to resolve water resources problems of an area through interdisciplinary planning. During this process, a local sponsor shares study costs from the reconnaissance phase through the feasibility phase, the preconstruction engineering and design phase, and construction. These studies provide a solid foundation for the Corps future civil works projects (U.S. Army Corps of Engineers, 2001a).

Historically, following development of coastal areas, severe erosion has occurred along the Atlantic coast of New Jersey causing extensive economic losses. Erosion of the shoreline has resulted from the action of storm tides, tidal currents, wind, waves, and swells. Substantial quantities of beach material are being lost continuously (often exacerbated by the effects of previously constructed hard stabilization structures), reducing protection from coastal storms. Public and private properties, as well as public utilities, are subject to storm damage from wave action and tidal inundation (U.S. Army Corps of Engineers, 2001a). The Corps, Philadelphia District has recently investigated adverse impacts associated with storm damages along the Atlantic coastal shoreline, and has determined the costs and benefits of potential federal projects through the New Jersey Shore Protection Study. These studies have resulted in a variety of recommended solutions, including beach nourishment or wetland protection and/or creation as a project feature. Alternatives generally involve the use of dredges for the excavation and placement of suitable material, from offshore or inlet borrow sources, onto New Jersey beaches.

The nine federal projects encompassed within the New Jersey Shore Protection Study are in various stages of development and implementation (U.S. Army Corps of Engineers, 2001a). Some, such as the Cape May Inlet to Lower Township (Cape May City) and Great Egg Harbor and Peck Beach (Ocean City) projects have undergone initial nourishment and subsequent

renourishment cycles. Others, such as the Hereford Inlet project are still in the feasibility phase of planning.

A brief summary of each of the nine federal projects encompassed within the New Jersey Shore Protection Study is provided below. Three projects, the Brigantine Inlet to Great Egg Harbor Inlet, Great Egg Harbor to Townsends Inlet, and the Townsends Inlet to Cape May Inlet projects are further broken into subprojects with individual initial construction and estimated renourishment cycle schedules as described below. Table 1 provides current project status and a summary of information regarding the initial and subsequent renourishment events for each individual project / sub-project. Complete project descriptions, along with the Environmental Impact Statement prepared pursuant to the National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq*.) (NEPA) and other planning documents prepared for each project, are on file at the Service's New Jersey Field Office as part of the FWCA activities undertaken by the Corps during the NEPA process.

Unless otherwise stated, the non-federal sponsor for each project is the NJDEP, Division of Engineering and Construction (U.S. Army Corps of Engineers, 2001a). A Project Cooperation Agreement (PCA) is signed by the Corps as the federal representative, and by the NJDEP as the project's non-federal sponsor. The PCA identifies the roles and responsibilities of the federal (Corps) and non-federal (NJDEP) parties to the agreement. Just as the PCA is the agreement between the Corps and NJDEP, a "State Aid Agreement" is the legal document signed by NJDEP and the municipality(s) that defines roles and responsibilities, including the municipal cash contribution toward the non-federal share of project costs and real estate requirements, such as easements and rights-of-way, that the municipality is responsible for obtaining. In addition to the formal relationships defined by the PCA and the State Aid Agreement, the Corps, NJDEP, and the involved municipality(s) frequently interact during the planning, design, and construction phases of a project. This interaction assures that the problems and interests of the municipality are adequately considered in the plan formulation process, and that viable project recommendations result from this process.

a. Manasquan Inlet to Barnegat Inlet

The project nourishment area lies within Ocean County and extends from the southern jetty at the Manasquan Inlet to Barnegat Inlet, a distance of approximately 24 miles. While included as part of the study area, no beachfill will be placed in the lower reach of the project, which extends approximately 10 miles from Berkeley Township to Barnegat Inlet and encompasses Island Beach State Park. The beachfront municipalities of Point Pleasant Beach, Bay Head, Mantoloking, South Mantoloking Beach, Normandy, Chadwick, Ocean, Lavallette, Ortley, Seaside Heights, Seaside Park, and South Seaside Park lie within the project boundaries.

The proposed plan involves construction of a dune at an elevation of +22 feet North American Vertical Datum (NAVD) in all areas, except Seaside Heights and northern Point Pleasant Beach where the design dune crest elevation is +18 ft NAVD. The design berm extends 75 feet in front of the dune, except at Seaside Heights and northern Point Pleasant beach where the design berm width is 100 feet. The design berm crest elevation is +8.5 ft NAVD at all areas, except northern

Table 1. New Jersey Shore Protection Study Project Summaries

PROJECT NAME	PROJECT STATUS	INITIAL FILL EVENT			RENOURISHMENT EVENT		
		Initial Year of Construction	Estimated Fill Quantity (cubic yards)	Duration	Estimated Cycle	Estimated Fill Quantity (cubic yards)	Duration
Manasquan Inlet to Barnegat Inlet	Final Feasibility Study	2007	10,400,000	15 months	4 years	640,000	3 months
Barnegat Inlet to Little Egg Inlet	Final Feasibility Study	2006	7,400,000	18 months	7 years	1,900,000	8 months
Brigantine Inlet to Great Egg Harbor Inlet: Brigantine Island	Initial Construction Pending	2005	648,000	3 months	6 years	312,000	3 months
Brigantine Inlet to Great Egg Harbor Inlet: Absecon Island	Initial Construction Complete	2003	6,200,000	18 months	3 years	1,666,000	6 months
Great Egg Harbor and Peck Beach	Renourishment Phase	1991	6,200,000	10 months	3 years	1,100,00	2 months
Great Egg Harbor to Townsends Inlet: Ocean City	Final Feasibility Study	2007	1,603,000	8 months	3 years	403,000	3 months
Great Egg Harbor to Townsends Inlet: Ludlam Island	Final Feasibility Study	2007	5,146,000	19 months	5 years	1,820,000	8 months
Townsends Inlet to Cape May Inlet: Seven Mile Island	Initial Construction Complete	2003	4,200,000	4.5 months	3 years	746,000	4 months
Townsends Inlet to Cape May Inlet: Stone Harbor Point	Initial Construction Pending	2006	500,000	3 months	None	None	None
Hereford Inlet to Cape May Inlet: Five Mile Beach	Beginning Feasibility Phase	2008	To be determined	To be determined	To be determined	To be determined	To be determined
Cape May Inlet to Lower Township	Renourishment Phase	1989	1,400,000	6 months	2 years	360,000	1 month
Lower Cape May Meadows to Cape May Point	Initial Construction Complete	2004	1,700,000	6 months	4 years	650,000	3 months

Point Pleasant Beach where the natural berm crest transitions to +11.5 ft NAVD due to the influence of the Manasquan Inlet south jetty. Sand will be dredged from two offshore borrow areas. A third potential borrow area, outside of the 3-mile mark, is also being investigated as a potential source for future sand needs. Nourishment activities are expected to take place every 4 years for a period of 50 years (U.S. Army Corps of Engineers, 2001a). No nourishment or dune construction will take place within Island Beach State Park (U.S. Army Corps of Engineers, 2002; Johnson, 2003).

b. Barnegat Inlet to Little Egg Inlet

The project area extends for approximately 20 miles along Long Beach Island in Ocean County and is bounded on the north by Barnegat Inlet and on the south by the Little Egg/Beach Haven Inlet complex. Long Beach Island is a sandy barrier island that contains the municipalities of Barnegat Light, Harvey Cedars, Surf City, Ship Bottom, Beach Haven, and Long Beach Township, (U.S. Army Corps of Engineers, 2001a). The project area also includes Barnegat Inlet State Park and the Holgate Unit of Edwin B. Forsythe NWR.

Comparison of shoreline charts shows a net erosion of shoreline over the past 133 years of record, resulting in the narrowing and lowering of beaches in the project area and subsequently reducing the storm protection that would have otherwise been available. The proposed beach nourishment project includes creation of a dune and beach of uniform profile, along the Atlantic coastlines of the municipalities of Harvey Cedars, Surf City, Ship Bottom, Beach Haven, and Long Beach Township, New Jersey. The proposed plan consists of a 125-foot-wide berm at elevation +8.0 feet NAVD and a dune at elevation +22 feet NAVD. The dune would be 30 feet wide at its crest and incorporate 347 acres of planted dune grasses and 540,000 linear feet of sand fencing. The total length of the dune/berm system would be about 16.9 miles. Initial construction would require placement of 7.4 million cubic yards of sand fill. About 1.9 million cubic yards of sand would be required for periodic nourishment, on average, at 7-year intervals for a period of 50 years. All beach fill would be taken from designated offshore borrow areas. The project does not include nourishment activities at Barnegat Light State Park or the Holgate Unit of Edwin B. Forsythe NWR (U.S. Army Corps of Engineers, 2001a; Johnson, 2003).

c. Brigantine Inlet to Great Egg Harbor Inlet

The project area lies within Atlantic County and encompasses Brigantine Island and Absecon Island and the municipalities of Brigantine, Atlantic City, Ventnor, Margate, and Longport (U.S. Army Corps of Engineers, 2001a). The Brigantine Natural Area, owned and managed by the NJDEP, Division of Parks and Forestry lies within the project area at the northern end of Brigantine Island. In addition, the southern end of Brigantine Island contains an expanse of undeveloped oceanfront beach and dunes north of the jetty at Absecon Inlet and an accreting undeveloped area facing the inlet.

The proposed plan for Brigantine Island includes construction of a 100-foot-wide berm and a dune at elevation +10 feet NAVD. Nourishment activities for Brigantine are expected to take place every 6 years for a period of 50 years. Other than an 800-foot taper on the northern end of

the project area that extends into the Brigantine Natural Area, no nourishment activities or dune construction is planned within the Brigantine Natural Area. The southern taper of the planned beachfill ends at 19th Street South, approximately 2.3 miles north of Absecon Inlet; therefore, no nourishment or stabilization activities are planned for the southern undeveloped area of Brigantine Island (U.S. Army Corps of Engineers, 1998; Johnson, 2003).

The proposed plan for Absecon Island consists of the construction of a 200-foot-wide berm with a top elevation of +7.25 feet NAVD in Atlantic City, and a 100-foot-wide berm with a top elevation of +7.25 feet NAVD in Ventnor, Margate, and Longport. In Ventnor, Margate, and Longport, dunes will also be constructed to a top elevation of +12.75 feet NAVD. The Atlantic City dune will have a top elevation of +14.75 feet NAVD. The dunes will be planted with 91 acres of dune grass (U.S. Army Corps of Engineers, 2001a).

d. Great Egg Harbor and Peck Beach

The project area, located in Cape May and Atlantic Counties, includes Great Egg Harbor Inlet and Peck Beach. Great Egg Harbor Inlet is an unimproved inlet that is approximately 1.1 miles wide at its narrowest point. The inlet provides a tidal connection between the Atlantic Ocean and Great Egg Harbor Bay, the New Jersey Intracoastal Waterway, and Great Egg Harbor River. Peck Beach extends from Great Egg Harbor Inlet southward for about 8 miles to Corson's Inlet and contains the City of Ocean City and Corson's Inlet State Park (U.S. Army Corps of Engineers, 2001a). The northern end of Peck Beach (north Ocean City) contains a wide, accreting area of sandy beach, tidal pools, and developing dunes lying waterward of development and along the ocean inlet.

The Great Egg Harbor and Peck Beach project area overlaps a portion of the Great Egg Harbor to Townsends Inlet project area (see below). The beach nourishment area for the Great Egg Harbor and Peck Beach project area extends from the Seaview Road groin southwest to 34th Street, with a 1,000-foot taper extending south to approximately 36th Street in Ocean City. The project plan consists of placing beachfill to an elevation of +6.75 feet NAVD with a minimum berm width of 100 feet and periodic nourishment of 1.1 million cubic yards every 3 years over the 50-year project life. The borrow area for the initial construction, and periodic nourishment is an ebb shoal area located approximately 5,000 feet offshore of the Great Egg Harbor Inlet. Periodic dredging of the ebb shoal area will alleviate navigation difficulties within the Great Egg Harbor Inlet (U.S. Army Corps of Engineers, 2001a).

Initial construction of the project began in October 1991 and was completed in July 1993 with a total of 6.2 million cubic yards being placed during two construction phases. The first cycle of periodic nourishment was completed in two phases. Phase 1 was completed in December 1994 using 606,000 cubic yards of fill; phase 2 was completed in August 1995 with the placement of 1.4 million cubic yards of sand. The second cycle of periodic nourishment was completed in October 1997 with the placement of 800,000 cubic yards of beachfill. The third cycle of periodic nourishment was completed in December 2000 with the placement of 1.3 million cubic yards of fill. The fourth nourishment cycle is scheduled for the fall of 2003 (U.S. Army Corps of

Engineers, 2001a). No beach nourishment has occurred or is planned for the undeveloped accreting area at north Ocean City or within Corson's Inlet State Park (Johnson, 2003).

e. Great Egg Harbor to Townsends Inlet

The project area consists of the coastal area from Great Egg Harbor Inlet to Townsends Inlet and encompasses the oceanfront communities of Ocean City on the island of Peck Beach and Strathmere and Sea Isle City on Ludlam Island (U.S. Army Corps of Engineers, 2001a). The project area includes the accreting undeveloped area in northern Ocean City at Great Egg Harbor Inlet (described above); Corson's Inlet State Park and Strathmere Natural Area, owned and managed by the NJDEP, Division of Parks and Forestry; and a sparsely developed area known as Whale Beach, lying between the communities of Strathmere and Sea Isle City.

A portion of the Great Egg Harbor to Townsends Inlet project area overlaps the Great Egg Harbor and Peck Beach project area (see above). The Great Egg Harbor to Townsends Inlet project beach nourishment area within Peck Beach extends for a total length of 2.6 miles from 34th Street to 59th Street in southern Ocean City. In addition, there is a taper of 734 feet south of 59th Street into Corson's Inlet State Park. The project plan includes construction of a beach berm and dune. The dune crest has a top elevation of +12.8 ft NAVD88, while the berm extends from the seaward toe of the dune for a distance of 100 feet at an elevation of +7.0 ft NAVD88. Sand will be obtained from an offshore borrow source identified as "M8." Sand quantity needed for initial construction is estimated at 1,603,000 cubic yards, including a design fill quantity of 1,192,000 cubic yards plus advanced nourishment of 403,000 cubic yards. Periodic nourishment of 403,000 cubic yards is scheduled to occur every 3 years synchronized with the Great Egg Harbor and Peck Beach beachfill project at Ocean City (Great Egg Harbor Inlet to 34th Street) (U.S. Army Corps of Engineers, 2001a).

The selected project plan for Ludlam Island consists of construction of a berm and dune using sand from three offshore borrow sources. The dune crest has a top elevation of +14.8 ft NAVD88, while the berm width extends from the seaward toe of the dune for a distance of 50 ft at an elevation of +6.0 ft NAVD88. The beachfill extends for a length of 6.5 miles from 125 feet north of Seaview Avenue in Strathmere to Pleasure Avenue (just beyond 93rd Street), with a taper of 66 feet into the terminal groin south of 93rd Street in Sea Isle City. Initial sand quantity for Ludlam is 5,146,000 cubic yards, which includes a design fill quantity of 3,326,000 cubic yards plus advanced nourishment of 1,820,000 cubic yards. Periodic nourishment of 1,820,000 cubic yards is scheduled to occur every 5 years (U.S. Army Corps of Engineers, 2001a).

No beach nourishment is planned for the undeveloped accreting area at north Ocean City. Except for the tapers described above, no nourishment or stabilization is planned for Corson's Inlet State Park and the Strathmere Natural Area. Beachfill activity is planned for the Whale Beach portion of this project area (Johnson, 2003).

f. Townsends Inlet to Cape May Inlet

The project area is located within Cape May County and extends for approximately 15 miles from Townsends Inlet to Cape May Inlet encompassing the two barrier islands of Seven Mile Island and Five Mile Beach. The Boroughs of Avalon and Stone Harbor are located on Seven Mile Island. Hereford Inlet separates Seven Mile Island from the second barrier island, known as Five Mile Beach. The Borough of Wildwood Crest and the cities of North Wildwood and Wildwood are located on Five Mile Beach. A small section of Lower Township, known as Diamond Beach, is also located in the project area between Wildwood Crest and the Cape May NWR / U.S. Coast Guard (USCG) LORAN Support Unit located adjacent to Cape May Inlet. The project consists of two components; shore protection for Seven Mile Island and environmental restoration at Stone Harbor Point. No work is planned for Five Mile Beach as part of this sub-project (U.S. Army Corps of Engineers, 2001a).

The selected plan for the Seven Mile Island project area consists of the construction of a 150-foot-wide berm at elevation +7.25 feet NAVD and a dune with a 25-foot crest width at elevation +14.75 feet NAVD for the oceanfront of Avalon and Stone Harbor. The selected oceanfront plans include planting dune grass, dune fencing, and suitable advance beachfill and periodic nourishment to ensure the integrity of the design (U.S. Army Corps of Engineers, 2001a). Initial beach nourishment of Seven Mile Island occurred in 2003 using 4,200,000 cubic yards of fill from designated offshore borrow sites within Townsends and Hereford Inlets. Periodic nourishment of Seven Mile Island is scheduled to occur every 3 years using 746,000 cubic yards of fill (U.S. Army Corps of Engineers, 1997). Within an area known as Avalon Dunes, located from 40th Street to 60th Street in Avalon, low density residential development is separated from the oceanfront beach by a wide area (ranging from 90 meters to over 300 meters) of dune and back-dune native vegetation. Historically /geologically this area has not experienced significant erosion and with the exception of some past sandfencing and planting of dune vegetation, the area remains in a natural state (Jenkins, pers. comm., 2004). Avalon Dunes was not nourished during the initial fill event and is not scheduled for nourishment during the 2006 renourishment cycle. However, although the Avalon Dunes area has remained stable without hard stabilization structures or beach nourishment, the area may be included in future nourishment cycles if conditions changed and the area eroded (Brandreth, pers. comm., 2004).

The Stone Harbor Point environmental restoration portion of the project, as modified by the Corps during previous formal consultation with the Service (U.S. Fish and Wildlife Service, 2002a), includes plantings of 2.2 acres of American beachgrass and approximately 31 acres of bayberry (*Myrica pennsylvanica*) while leaving 67 acres of exposed sand berm unvegetated as beach nesting bird habitat. The project will also create approximately 15 acres of bayside intertidal foraging habitat. The restoration plan requires 500,000 cubic yards of fill. On the oceanfront of the restoration site, the plan includes a 150-foot-wide berm at elevation +7.25 feet NAVD and a dune at elevation +11.25 feet NAVD with a crest width of 25 feet and a geotextile core extending approximately 700 feet southwest of the terminal groin in southern Stone Harbor. Along the inlet frontage, the beach will transition 350 linear feet to the west with a varied berm width at elevation +4.75 feet NAVD. Dunes along the inlet frontage will be constructed as segmented dunes with an elevation of +8.75 feet NAVD and a crest width of 20 feet. The

segmented dunes will continue west along the inlet for 375 feet. Constructed dunes will have a 5:1 slope. Sand fencing will be placed approximately 10 feet from the dune toe and will be constructed in a staggered fashion (U.S. Fish and Wildlife Service, 2002a).

g. Hereford Inlet to Cape May Inlet

This project is in the beginning of the feasibility phase. The study area is located in Cape May County, New Jersey on a barrier island bounded by Hereford Inlet to the north and Cape May Inlet to the south. The northern portion of the island, known as Five Mile Beach, includes the towns of North Wildwood, Wildwood, and Wildwood Crest. The oceanfront beaches of Wildwood and Wildwood Crest have been receiving a steady accumulation of sand on a low, extensive berm. This material regularly clogs municipal storm-water systems, impedes drainage, and creates unsanitary beach conditions. In addition, ponding behind the high tide line is creating associated health and safety concerns. In contrast, the oceanfront area of North Wildwood is experiencing berm and dune erosion. These conditions could expose the city's roads and homes to storm and flood damage. The Corps feasibility study will consider re-aligning the beaches to accommodate the storm-water and ponding problems in Wildwood and Wildwood Crest while accommodating the storm damage vulnerability of North Wildwood.

The southern portion of the island, known as Two Mile Beach, includes the Two Mile Beach Unit of Cape May NWR and the USCG LORAN Station. These southern areas, including an area known as Diamond Beach, will most likely not be included in plans for nourishment or dredging activity (Brandreth, pers. comm., 2003; Johnson, 2003).

h. Cape May Inlet to Lower Township

The project area is located within Cape May County and includes the USCG Training Center and the City of Cape May. The selected plan for the project included extension of two groins and periodic nourishment with sand obtained from an approved offshore borrow source to construct a berm at elevation +6.7 feet NAVD with a variable width of 25 to 180 feet. Renourishment will occur every 2 years using an estimated 360,000 cubic yards of fill (U.S. Army Corps of Engineers, 2001a).

Initial construction of the project began in 1989 and was completed by the District in 1991 in two major phases: placement of 465,000 cubic yards of sand on the USCG Training Center beach (completed in August 1989), followed by a separate contract placing 900,000 cubic yards on the Cape May City beach (completed in July 1991). Initial construction also included the extension of existing groins at Baltimore and Trenton Avenues in Cape May City (U.S. Army Corps of Engineers, 2001a).

Following the initial construction, periodic nourishment was completed in 1993, 1995, 1997, 1999, and 2003. The first cycle of periodic nourishment was completed in April 1993 with the placement of 415,000 cubic yards of fill. A storm rehabilitation was completed in September 1993 with the placement of 300,000 cubic yards of sand. The second cycle of periodic nourishment was completed in March 1995 with the placement of 330,000 cubic yards of fill.

The third cycle of periodic nourishment was completed in January 1997 with the placement of 366,000 cubic yards of sand. The forth cycle of periodic nourishment was completed in November 1999 with the placement of 400,000 cubic yards of fill (U.S. Army Corps of Engineers, 2001a). The fifth cycle of periodic nourishment was completed in March 2003 with placement of 267,083 cubic yards of sand (Brandreth, pers. comm., 2003)

i. Lower Cape May Meadows to Cape May Point

The Lower Cape May Meadows - Cape May Point project area extends approximately 2.4 miles along the Atlantic Ocean coast, within the Borough of Cape May Point and the Borough of West Cape May in Cape May County (U.S. Army Corps of Engineers, 2001a). The Lower Cape May Meadows encompasses Cape May Point State Park, owned and managed by the New Jersey Division of Parks and Forestry and the Cape May Migratory Bird Refuge, owned and managed by The Nature Conservancy. Lower Cape May Meadows is recognized as an internationally significant coastal wetland due to its importance to migratory birds along the Atlantic flyway. The site is included in the Ramsar List of Wetlands of International Importance and is part of the Western Hemisphere Shorebird Reserve Network (U.S. Fish and Wildlife Service, 2003a).

Shoreline erosion within the Lower Cape May Meadows has been exacerbated as a result of the construction of the Cape May Harbor jetties in 1911. The project is designed to protect and restore beach and freshwater wetland habitats, improve water quality and hydrology within the Lower Cape May Meadows wetland / upland complex, and eliminate invasive plant species such as common reed (*Phragmites australis*). The project also provides incidental benefits to the Borough of Cape May Point by providing shore protection from storm damage. Specifically, the project involves the construction of a berm and dune, in addition to dune grass plantings and installation of sand fence for dune stability. The project will restore 25 acres of salt marsh; eliminate 95 acres of common reed by herbicide and burn treatment; replant native, beneficial emergent and scrub / shrub wetland vegetation; reconnect the hydrologic link between internal ponds; establish 2 water control structures; and excavate 6 new fish reservoirs within existing ponds (U.S. Army Corps of Engineers, 2001a).

The project plan, as modified by the Corps during previous formal consultation with the Service to preserve and enhance piping plover habitat (U.S. Fish and Wildlife Service, 2003a), includes construction of a 157-foot-wide berm at elevation +6.75 feet NAVD and a dune at +16.7 feet NAVD with a width of 25 feet in Cape May Point Borough. Within the Cape May Migratory Bird Refuge portion of the project area, project modifications include retaining the existing secondary dune and overwash habitat and enhancing the existing dune line rather than constructing a new seaward primary dune line. At the boundary of the Cape May Point State Park and the Cape May Migratory Bird Refuge, the design elevation of the forward beach berm transitions from an elevation of +6.75 feet down to +4.75 feet to allow periodic storm overwash into existing piping plover habitat at the Cape May Migratory Bird Refuge. Within Cape May Point State Park, plover “walkover” areas were constructed at 600-foot intervals along the length of the dune to encourage plover access to back dune habitats and freshwater wetlands. These walkover areas are each approximately 100 feet wide and have a gentler slope and less vegetation than the remainder of the dune (U.S. Fish and Wildlife Service, 2003a).

The dune construction and initial sand placement of approximately 1,300,000 cubic yards began in Fall 2004 and lasted approximately 6 months. Periodic beach renourishment will occur every 4 years and construction will last approximately 3 months (U.S. Fish and Wildlife Service, 2003a).

2. Civil Works Projects – Stabilization Structures

As part of the New Jersey Shore Protection Study, the Corps plans to repair, replace, and / or extend three existing hardened structures.

a. Townsends Inlet Seawall

The project site is located within Avalon, Cape May County, New Jersey adjacent to Townsends Inlet. The seawall is part of the New Jersey Shore Protection Study - Townsends Inlet to Cape May Inlet Shoreline Protection Study. Repair of the Townsends Inlet seawall includes removal of existing stone, excavation, placement of a foundation mattress, placement of core stone, and placement of capstone ranging in weight between 5 and 8 tons. An existing timber bulkhead may require repair as part of the construction. Marine construction within an open ocean inlet may be required to complete the construction. The required quantity of stone to complete the project is estimated to be greater than 115,000 tons. The completed seawall length will be approximately 2,950 feet and will extend from the beginning of the existing bulkhead to the 8th Street groin.

One materials staging area will be on the beach berm adjacent to the terminal groin in Avalon, within a recently disturbed area previously used to stockpile rock used by the NJDEP for repair to the groin. Additional staging areas may be established within upland areas in Avalon. Completion time is estimated at 365 calendar days. The start date of construction was Fall/Winter 2004.

b. Hereford Inlet Seawall

The project site is located within North Wildwood, Cape May County, New Jersey adjacent to Hereford Inlet. The seawall is part of the New Jersey Shore Protection Study - Townsends Inlet to Cape May Inlet. The existing hardened structures at Hereford Inlet are a combination of seawall and bulkhead in various states of disrepair and elevation. Repairs will include removal of existing stone, excavation, placement of a foundation mattress, placement of core stone, and placement of capstone ranging in weight between 5 and 8 tons. An existing timber bulkhead may require repair or replacement as part of the construction. Marine construction within an open ocean inlet may be required to complete the construction. The required quantity of stone to complete the project is estimated to be greater than 250,000 tons. The completed seawall length will be approximately 8,200 feet. Staging areas for materials were coordinated to avoid disturbance to piping plover nesting areas. The start date of construction was Winter 2004 and completion time is estimated to be 730 calendar days.

c. Absecon Inlet Bulkhead and Revetment

The project is located within Atlantic City, Atlantic County, New Jersey adjacent to Absecon Inlet. The seawall is part of the New Jersey Shore Protection Study – Brigantine Inlet to Great Egg Harbor Inlet. Two sections of timber bulkhead with stone revetment from Oriental Avenue to Atlantic Avenue, totaling 1,050 linear feet, and from Madison Avenue to Melrose Avenue, totaling 550 linear feet, would be replaced/repaired along the Absecon Inlet frontage. Both bulkheads will have a top elevation of +12.75 feet NAVD. Staging areas for storage of materials and equipment have not yet been determined. The anticipated start date of the Absecon Inlet seawall construction is Winter 2006 or Spring 2007. The project is anticipated to take a full year to complete.

3. Regulatory Program

Under the Rivers and Harbors Appropriation Act and the Clean Water Act, the Corps is responsible for issuing permits to other entities (*i.e*., State or local applicants) for activities involving waters of the United States, including offshore dredging and beachfill activities. Through the permitting process, the Corps coordinates potential activities with other State and federal agencies, such as the Service and National Marine Fisheries Service (NMFS), to ensure that the concerns of these agencies are addressed in the permit and any subsequent activities (U.S. Army Corps of Engineers, 2001a).

The Regulatory Branch of the Philadelphia District currently has three active permits for beachfill activities along the coast of New Jersey. Descriptions of these permitted activities are provided below. These permits were initially issued to either the NJDEP or a local municipality between 2000 and 2001 and will expire between 2005 and 2011. All three permits contained conditions calling for seasonal restrictions on work activities to protect piping plovers. The permits issued for Ocean City and Strathmere also included a condition requiring development and implementation of site-specific management plans to ensure protection of federally listed species. The plans must be consistent with the USFWS (1994) "*Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitat on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act*" (U.S. Army Corps of Engineers, 2001a). The three outstanding permits are as follows:

- Brigantine: The permit (# 200001879) was issued in 2000 and will expire December 31, 2005. This permit allows for the placement of 400,000 cubic yards of sand for erosion protection.

- Ocean City (Southern End): The permit (# 200002238) was issued in 2000 and will expire December 31, 2010. This permit allows for the placement of approximately 350,000 cubic yards of sand for erosion protection. Construction under this permit was completed in December 2000.

- Strathmere (Upper Township): The permit (# 200002280) was issued in 2001 and will expire December 31, 2011. The permit allowed placement of approximately 250,000

cubic yards of sand for erosion protection. Project construction was completed in Fall 2001. The permit authorizes maintenance through 2011.

All of the permitted areas listed above fall within the boundaries of proposed District federal beach nourishment projects. The Corps expects that the need and frequency for State or local beachfills will be greatly reduced following implementation of the federal projects. Many of the above municipalities have been placing fill in the most vulnerable areas purely as a stop-gap measure until the federal project for their respective area is authorized and constructed. If the federally sponsored projects are funded and implemented as planned, the local municipalities will have no need to place additional sand on the beaches, except for emergency fill needs (*i.e.*, following a major storm or coastal flooding event). However, if further work is required under these permits, the conditions of the permits will be modified to ensure that they are consistent with the District's protective measures and practices for piping plovers and seabeach amaranth as described in Section III.C below. In addition, site-specific measures to ensure protection of federally listed species will be developed as necessary (U.S. Army Corps of Engineers, 2001a; Boyer, pers. comm., 2003). Any new permits issued will incorporate the Corps protective measures and practices for piping plovers and seabeach amaranth, as described within this Biological Opinion. Based on site conditions, site-specific protective measures will be developed as necessary to protect federally listed species.

4. Operations and Maintenance Activities

In addition to the Corps planning and regulatory activities described above, routine post-construction operational, maintenance, and survey work activities take place on coastal beaches with existing, operational Corps projects. Operations and maintenance activities are those activities that are required to: (1) ensure that an existing project functions in its designed manner, or (2) correct any degradation of the project or surrounding site that may threaten the integrity of the project or pose a threat to human health or lives (U.S. Army Corps of Engineers, 2001a). In general, the Corps anticipates that approximately 2 operations and maintenance projects with potential to impact piping plovers and / or seabeach amaranth will be conducted in any given year (Brandreth, pers. comm., 2004). To minimize and / or avoid impacts to these species, any future operations, maintenance, or survey work done will follow the protective measures and procedures set forth in this Biological Opinion (U.S. Army Corps of Engineers, 2001a). The following types of activities have been performed in the past and can be expected to continue in the foreseeable future (Brandeth, pers. comm., 2004).

- Maintenance dredging in Manasquan Inlet: This inlet is periodically dredged. Some sand dredged from the inlet is placed in the subtidal zone just off the ocean beach front; the remainder is placed in an open water disposal area.

- Maintenance dredging in Barnegat Inlet: This inlet is dredged every year, but most of the sand is placed in an open water disposal area. Sand is sometimes placed in the subtidal area off of the town of Loveladies.

- Maintenance dredging in Cape May Inlet: Some of the sand dredged from this Inlet is placed on the beach near the USCG LORAN tower. The inlet is dredged approximately every other year, but sand is not always placed on the beach.

- Maintenance of geotubes at Sedge Island: Placement of sand in front of the geotubes at Sedge Island has occurred twice since 2000 and is likely to be required again in 2004 due to the erosion that is taking place along a portion of the geotube.

In addition, operation and maintenance projects covered by this programmatic Biological Opinion include periodic minor maintenance of existing hard structures or more extensive repairs that are not anticipated to result in disturbance to listed species or further degradation of listed species habitat. Maintenance of the jetties at Barnegat Inlet is an example of a typical periodic operation and maintenance project. In the early 1990s the alignment of the jetties was corrected in an attempt to stabilize the dangerous features of the inlet and reduce back bay flooding. Recently, it was necessary to repair a portion of the revetment that provides stability for the foundation of the inlet lighthouse. The repairs were made by placing stone-filled geogrid mattresses with geotextile liners and rip rap in the degraded area to help prevent further scour. The Corps also conducts maintenance of jetties at Manasquan Inlet and Cape May (Cold Springs) Inlet. Recently, it was necessary to install gabions along the Cape May Inlet jetty for stabilization; additional maintenance may be required. Any future operation, maintenance, or survey work done on any of these structures will follow the protective measures and procedures set forth in Section III.C below of this Biological Opinion for the protection of plovers and seabeach amaranth (U.S. Army Corps of Engineers, 2001a).

Corps operation and maintenance activities that cannot incorporate the appropriate protective measures and procedures, projects involving new hard structure construction not specifically addressed within this Biological Opinion, or realignment of existing structures that would further degrade habitat for listed species, will require separate consultation with the Service.

Beach profile surveys are also a maintenance component associated with completed beach nourishment projects. Semi-annual surveys are conducted to track changes in beach profiles following the winter and summer seasons and to track overall project performance. Surveys will be conducted on each operational federal project area and generally take place each spring and fall. Surveys are currently conducted both on foot and with the aid of a survey “sled” that is pulled through the surf zone with either a boat or 4-wheel drive vehicle. Changes are being made to the survey program, however, which will most likely result in use of methodology that does not require the use of a sled. The Corps will continue to schedule the spring surveys so they will occur between late March and early April in order to avoid and/or minimize impacts to plovers. Surveys must be conducted during this time in order to characterize the post-winter conditions. Surveys done prior to this time are difficult due to winter weather conditions and also run the risk of missing changes associated with late season storms (U.S. Army Corps of Engineers, 2001a).

C. CONSERVATION MEASURES PROPOSED TO MINIMIZE IMPACTS TO FEDERALLY LISTED SPECIES

The Corps will attempt to schedule and complete as much of the Program (*i.e*., nourishment, hard structure replacement, operations and maintenance) activity as possible outside of the piping plover nesting season. However, should an unplanned and unforeseen delay occur (*i.e*., weather–related work stoppages or equipment failure), Program work activities may extend into the piping plover nesting season. Therefore, the Corps has developed the below conservation measures to be incorporated into project plans, specifications, and scheduling to avoid impacts to nesting piping plovers. Many of these are standard measures included in all projects, while others are specifically designed to protect plovers. In addition, seabeach amaranth has been documented within the Program Area (New Jersey Office of Natural Lands Management, 2002; Kelly, pers. comm., 2002) and can be reasonably expected to colonize additional sites within the Program Area over the 50-year life of the nourishment projects. Therefore, the Corps has developed several measures to minimize or avoid adverse impacts to seabeach amaranth from Program activities.

1. Materials and Materials Placement

All nourishment material used in Corps sponsored or permitted projects will consist of clean sand fill material (*i.e*., 90 percent or greater sand) obtained from approved off-shore borrow areas. Grain size of fill material will be suitable for beach nourishment and will be similar in composition to the existing beach substrate on the targeted deposition site. Excavated sediments shall be placed directly onto the placement site to the greatest extent possible. Fill will consist of materials that will not preclude future use by piping plover or colonization by seabeach amaranth.

2. Materials Stockpiling and Equipment Storage

No materials or equipment associated with beach nourishment or hard structure repair or replacement will be stockpiled or stored within 100 meters of known piping plover nesting areas or sites colonized by seabeach amaranth. Any materials or equipment stored adjacent to known plover nesting areas will be removed prior to the nesting season (March 15th) and the areas will be restored to pre-project conditions with the exception of materials storage for the Townsends Inlet seawall project. Site-specific conservation measures for the Townsends Inlet seawall are described below.

3. Dune Stabilization and Vegetation Planting

The Corps will work with the Service, the NJDEP, and the USDA to develop guidelines for planting and maintaining dune and beach vegetation and erecting sand fence on Corps nourished beaches that are protective of federally listed species while not diminishing the overall required beach protection function and/or dune stability. The guidelines will ensure that vegetation plantings and sand fencing used are compatible with the habitat requirements of federally listed species and that suitable habitat conditions are maintained over the life of the project.

Vegetation and sand fencing should be maintained at densities that will not displace federally listed species from occupied sites, deter future colonization of unoccupied sites, or impede chick movements. The guidelines will be adapted as necessary as new information or improved techniques become available.

4. Extension of Outfall Structures

Following placement of sand, extension of some existing outfall structures may be required. Work associated with outfall structure extension is an integral part of a beachfill project and will be conducted in accordance with all proposed conservation measures to protect federally listed species.

5. Access Into Construction Areas

The Service and the ENSP, or their designated representatives, will be given access to Program construction areas, subject to site safety plans, for the purpose of surveying; monitoring; posting; symbolically fencing of piping plover courtship, nesting, and brood rearing areas; and erecting predator exclosures around nests. In addition, the Service and the NJDEP, Natural Heritage Program (NHP), Office of Natural Lands Management (ONLM), or their designated representatives, will be given access to Program construction areas, subject to site safety plans, to survey potentially suitable areas for seabeach amaranth. In the event the species is found, access will be provided for the purposes of monitoring, posting, or symbolically fencing seabeach amaranth areas. Access will be given on any day(s) at the frequency required to accomplish the purposes stated above.

6. Contractor Notification

The Corps will ensure that all contractors and employees will be adequately informed of ESA concerns, and contract specifications will be written accordingly. These concerns shall be highlighted prior to construction actions.

7. Legal Easements

The local project sponsor will obtain legal easements allowing Service, State, and Corps representatives access to all portions of the project area over the life of each individual project for the purposes of carrying out endangered species management activities, including, but not limited to, installation of protective fencing, observation, and data collection. (Note: Project life for individual projects varies depending on project type and current project phase and is described within the Corps NEPA and other planning documents).

8. Conservation Measures to Protect Piping Plovers

For the purposes of this Biological Opinion a piping plover “nesting area” is defined by the Service as the entire site currently occupied by courting, territorial, incubating, or brood-rearing piping plovers, nests with eggs, unfledged chicks, or fledged chicks that have not yet left their

natal area, or any site so occupied during any of the three most recent nesting seasons (including the current season if territories have already been established for the year). "Potentially suitable" piping plover nesting habitat is habitat that contains natural features associated with known plover habitat and that could be reasonably expected to be occupied by piping plovers either in the upcoming nesting season or in the reasonably foreseeable future. For the purposes of this Biological Opinion a "fledged chick" will be defined as one that has been observed in level flight for more than 15 meters, rather than a chick having reached 25 days of age.

During individual streamlined consultations the Service, in coordination with ENSP, will provide the Corps with information and maps defining the nesting areas in proximity to the target construction area and the boundaries of the associated buffer areas.

a. Pipeline Placement

During the piping plover nesting season, hydraulic pipelines will be placed offshore in areas of known piping plover nesting habitat or areas identified as potentially suitable habitat. Offshore pipeline placement will avoid interference with nest site selection and allow piping plover chicks unobstructed access to intertidal zone foraging habitat. A Corps biologist or designated representative will be present during pipeline construction to ensure adherence to the approved alignment.

On newly nourished beaches outside of current nesting areas and established buffer areas, pipelines may be placed and remain on the beach during construction activities. Pipelines can be placed within nesting areas during the non-nesting season provided they are removed prior to March 15.

b. Project Scheduling, Timing Restrictions, and Buffers

(1) Beach Nourishment

The Corps will contact the Service at least 3 months prior to each nourishment event, preferably during development of individual project plans and specifications, to identify piping plover nesting areas of concern within and adjacent to the planned Program activity[1]. Nourishment or operations and maintenance activities will be scheduled and sequenced to avoid or minimize construction activities during the nesting season within known piping plover nesting areas. The Corps will schedule fill placement in piping plover nesting areas to allow as much time as possible between the completion of fill activities and the beginning of the nesting season to allow the intertidal benthic community to recover. For areas where habitat conditions have changed substantially, such that suitable habitat is no longer present, a case-by-case evaluation of the site will be conducted by the Service in coordination with the Corps and the ENSP. Where

[1] For projects that do not comply with the protective conservation measures and terms and conditions of this programmatic Biological Opinion, the Corps must initiate individual formal consultation and allow sufficient time for the full formal consultation process (at least 135 days from the Service's receipt of a complete initiation package).

warranted, areas having no current potential as courting, nesting, or brood-rearing habitat will be eliminated from the area defined as nesting habitat.

No construction will take place during the nesting season (March 15th to August 15th) within a protective buffer area extending from each nesting area as described below. Buffer areas will extend from the water's edge landward to the furthest seaward extent of the natural or man made feature which would prohibit piping plover chicks from traversing the area (*e.g.*, dune, boardwalk or bulkhead). Within nesting and buffer areas, work will be completed by March 15th or will proceed following conclusion of the nesting season. With the presence of an approved qualified piping plover construction monitor, work outside piping plover nesting and buffer areas may proceed during the nesting season subject to the restrictions outlined within this Biological Opinion.

In general, known piping plover nesting areas will be afforded a 1,000-meter buffer so as not to interfere with courtship activities, nest site selection, and brood rearing. However, if due to eroded beach conditions or other beach features, no potentially suitable piping plover habitat is likely to be present within the buffer area during the affected nesting season, the buffer area may be reduced on a case-by-case basis by the Service. Reduced buffers will be developed through close coordination between the Corps, the Service, and the ENSP and will be sufficient in size to prevent disturbance to birds establishing or incubating nests and to protect broods. For example, for the initial construction of the Townsends Inlet to Hereford Inlet project in 2002-2003, the buffer at North Avalon was reduced to approximately 230 meters due to the beach configuration, severely eroded conditions, and past piping plover use within the area. Due to erosion, suitable piping plover habitat was no longer present between 18th and 22nd Streets; therefore, for the 2003 nesting season, within this portion of North Avalon, plovers were not expected to initiate nesting or move broods into the area for foraging. Reducing the buffer had no adverse effect on piping plovers nesting adjacent to the North Avalon jetty.

Except as provided above, once piping plover nests have hatched and chicks are mobile (approximately May 15th), no construction will take place within 1,000 meters of chick foraging areas until after the chicks have fledged as determined by the Corps qualified monitor or the ENSP and confirmed by the Service. Fledging of young is usually completed by August 15th, but has been documented to occur as late as August 30. Once fledging of all chicks within a nesting area has been confirmed by the Service, in coordination with the ENSP, the 1,000-meter protective buffer areas will be reduced to 300 meters from the area used for foraging while the fledged chicks remain within their nesting area. Once fledged chicks have left the nesting area, they will be considered transient migrants and work may proceed with no further piping plover protective restrictions.

If a piping plover is observed between March 15 and August 15 in a previously unoccupied area, the Corps will immediately contact the Service to determine necessary protective actions, and temporary buffers will be established. Prior to May 15th, a temporary buffer of 300 meters will be established around areas newly occupied by foraging adult plovers or plovers displaying territorial behavior. From May 15th to August 15th, the temporary buffer will be 1,000 meters. If nesting behavior (*i.e.*, active scrapes or copulation) is confirmed, or if nests or chicks are found,

a buffer sufficient in size to prevent disturbance to nesting birds and / or to protect unfledged broods will be established based on site-specific conditions and will remain in effect until the conclusion of breeding activity. If birds are not displaying any signs of nesting behavior (*i.e.*, are likely to be non-nesting birds or spring migrants) or are no longer sighted after 4 days of observation, the temporary buffers will be removed.

If determined to be inadequate to prevent disturbance, any of the aforementioned buffers will be enlarged as needed based on site-specific information and behavioral observations of individual birds. All construction-related activities (*e.g.*, vehicle use, laying pipeline, dredging operations, surveying, framing, equipment set-up) will adhere to the appropriate buffer area restrictions. Where necessary, fill or other materials will be stockpiled on beach areas outside of the required buffer area and subsequently transferred to target fill areas at the conclusion of the piping plover nesting season. Stockpiled materials will be placed to avoid impeding piping plover access to feeding areas. Feeding areas include, but are not limited to, ocean, inlet, and bayside intertidal areas, tidal pools, and moist soil flats.

(2) Repair and Maintenance of Hard Structures

The Corps will contact the Service at least 3 months prior to each activity event, preferably during development of individual project plans and specifications, to identify piping plover nesting areas of concern within and adjacent to the planned Program activity. Repair and maintenance of hard structures and associated operations and maintenance activities will be scheduled and sequenced to avoid or minimize construction activities during the nesting season (March 15th to August 15th) within known piping plover nesting areas or areas likely to be occupied during the affected nesting season.

For the Townsends Inlet, Hereford Inlet, and Absecon Inlet seawall projects, the projects will be sequenced such that seawall construction near known nesting habitat will occur outside the plover nesting season. A minimum of 100-meter buffer area will be established from any known piping plover nesting areas; no construction related activity, including but not limited to vehicle use and transfer of materials from stockpiles, will occur within 100 meters of piping plover nesting areas until all chicks from a site have fledged.

c. Beach Profile Surveys

Yearly beach profile surveys will be conducted outside of the nesting season to the greatest extent possible. If work must be done during the nesting season, the Corps will prioritize historical nesting areas vs. non-nesting areas to schedule surveys of sensitive areas outside of the nesting season. If work must be conducted in a nesting area after nesting has begun, the Corps and its surveying contractor will coordinate with the ENSP to ensure that plover monitors are on site to escort surveyors through the nesting area. Use of the survey sled will be limited to the lower portion of the beach to avoid impacting nesting birds. If work cannot be completed prior to nest establishment, it may be necessary for the Corps to omit or relocate certain survey lines to avoid disturbance to nests or chicks.

d. Contractor Access Into Nesting and Buffer Areas

No contractor shall be allowed into designated nesting areas without being accompanied by a qualified biologist. If it is necessary to enter a nesting area after nesting has begun, the Corps or its designated representative will coordinate with the ENSP and / or the Service to ensure that plover monitors are on site to escort workers through the nesting area. No motorized vehicles will be operated within the unfledged chick and nesting buffer areas unless authorized by the Service on a case-by-case basis and intensive monitoring is in place. Motorized vehicles will not be authorized access within 100 meters of unfledged chicks or nests under any circumstances except in the case of a *bona fide* emergency.

e. Monitoring and Management During Construction Events

The Corps will implement a monitoring program to ensure that construction activities occurring during the piping plover nesting season (March 15th to August 15th) minimize or avoid adverse impacts to the species. The Corps will coordinate with the Service and ENSP to develop specifications for monitor qualifications, monitoring procedures, and notification protocols and procedures.

The Corps will provide a designated contracted construction biologist / monitor (construction monitor), funded by the Corps and / or the State or local sponsor. No construction activities will take place during the piping plover nesting season unless a qualified construction monitor is present within the project area. Generally, a construction monitor will be required from March 15th until August 15th unless the Service and the ENSP concur that construction-related monitoring may end earlier due to the proximity of known plover nesting sites and project area site conditions.

The construction monitor will maintain complete contemporaneous field notes, which will be provided to the Service and the ENSP upon request. The construction monitor will provide weekly summary updates of nesting activity by e-mail or facsimile to Corps, Service, ENSP, and appropriate municipal officials. At the completion of the nesting season, a complete copy of all field notes will be provided to the Service and ENSP.

(1) Piping Plover Monitoring Within Construction Areas

The primary role of the construction monitor is to ensure that no previously undetected piping plover nests or broods are located within the construction area and to monitor movements of unfledged chicks from adjacent known nesting areas that may disperse into the construction area. The Corps' designated construction monitor will conduct daily surveys for piping plovers prior to and during construction (see requirements for frequency and duration below).

Piping plover surveys by the construction monitor will begin on March 15th and will continue until all chicks from adjacent nesting sites have fledged or construction-related activities have terminated. The Corps will ensure coordination between the designated construction monitor and the project construction engineer responsible for oversight of construction activities.

Piping plovers may establish new nesting territories in previously unoccupied areas. Therefore, no construction activities will take place between March 15th and July 1st unless the construction monitor has determined that the vicinity of the active construction site is unoccupied. Work in non-nesting portions of the project area may commence only if the construction monitor has detected no piping plovers in the area after 4 days of surveying, throughout the full tidal cycle, in the preceding week. The construction monitor will be kept apprized of the construction schedule to ensure that surveys have been completed within any areas where work will commence within the next week. If a piping plover is observed at any time in a previously unoccupied area, the construction monitor will immediately notify the project construction engineer and the Service to determine necessary protective actions. The construction monitor will ensure that temporary buffers, as described above, are established immediately until the monitor can determine whether the plovers are migrants or are engaged in breeding activity. If nesting activity is confirmed, the buffer will be expanded and remain in effect until the conclusion of breeding activity. If birds are not sighted during 4 consecutive days of observation, throughout the full tidal cycle, the temporary buffers will be removed. The construction monitor will coordinate closely with the project construction engineer responsible for oversight of construction activities to ensure that the engineer is aware of the location of piping plover nest sites and the appropriate buffer areas.

With written concurrence from the Service and the ENSP, work greater than 1,000 meters from a known nesting area may proceed in non-nesting portions of the project area after July 1st provided no piping plover activity has been observed within the remaining construction area after 8 days of monitoring, throughout the full tidal cycle, over the previous 2-week period. If these conditions have been met, no further monitoring will be required.

(2) Monitoring Within Piping Plover Nesting Areas and Buffers

A secondary role of the Corps' designated construction monitor is to ensure that appropriate protective buffer areas are established and maintained surrounding known nesting and chick foraging areas. The construction monitor will coordinate with the ENSP to become familiar with the locations of known or suspected territorial pairs, nest sites, and chick foraging areas. The construction monitor will notify the ENSP immediately of any new nests found and, if requested, will assist the ENSP in fencing nesting or foraging areas and erecting predator exclosures. The construction monitor will not enter fenced nesting areas unless authorized by the ENSP or the Service.

The Corps' construction monitor will ensure that the boundaries of protective buffer areas surrounding piping plover nesting and brood rearing sites are delineated, clearly visible to construction crews, and properly maintained throughout the nesting season. The boundaries may be delineated by signs, fencing, or reference to existing features (*i.e.*, a street or highly visible building). For beach nourishment projects, once chicks hatch, the Corps' construction monitor will immediately expand the protective buffer of any site-specific reduced buffer areas to 1,000 meters surrounding the chick foraging area and notify the project construction engineer.

The construction monitor will accompany the Corps or its contractors on any Service- and ENSP-authorized temporary intrusions into fenced piping plover areas or buffers (*i.e.*, to conduct beach profile surveys). The construction monitor will observe nesting and foraging adults and broods and will record any disturbance from project activities, including construction, survey, stockpiling, access routes, and transportation of new material to the construction site. If necessary, the construction monitor will initiate immediate temporary corrective actions to avoid further impacts. A procedure will be established to ensure that the construction monitor can make timely notification to the project construction engineer, and Corps, Service and ENSP representatives. Following notification by the construction monitor, the project construction engineer will ensure that on-site contractors are notified immediately and activities adjusted or halted to avoid or minimize any immediate threat to the birds. The construction monitor and project construction engineer will then confer with the Corps project biologist and Service and ENSP representatives to establish permanent procedures to abate the disturbance. If the construction monitor observes plovers reacting to project activities or plovers moving away from original nest sites, the boundaries of the protective buffer areas will be expanded. Protective buffer areas will not be reduced without written concurrence from the Service and the ENSP.

With written concurrence from the Service, within known nesting sites and designated buffers, work may proceed after July 1st without further restrictions if nests are confirmed to have failed and/or all nesting or brood-rearing activity within the site has ended <u>and</u> provided the area is greater than 1,000 meters from any adjacent active nesting area. Work may proceed only if no breeding activity has been observed after 8 days of monitoring, throughout the full tidal cycle, over at least 2 weeks and the Service and the ENSP concur that the site has been abandoned.

If unanticipated disturbance of piping plovers cannot be avoided from the ongoing construction activities, the Corps will contact the Service by the end of that working day for further consultation. If an adult or chick is injured or killed during construction activities, two sets of actions will be undertaken by the monitor: (1) notification of all appropriate personnel (Corps, Service, ENSP, contractor, managers) and (2) collection of evidence and additional information as necessary to produce a written record of the incident. The information collected will include a detailed description of the incident, the time and location, maps, photographs (if possible), and names and telephone numbers of witnesses to the incident or the discovery.

f. <u>Monitoring and Management Following Construction of Civil Works Projects</u>

The Corps will fund a comprehensive program to monitor piping plovers on a yearly basis within each project area, beginning with the first nesting season after initial project construction and continuing for the life of the project or until assumed by the State or local project sponsor. The Corps will accomplish the monitoring through transfer funding to the ENSP to carry out and oversee the monitoring activities or through other similar monitoring arrangements. The local site monitor (local monitor) will be trained by the ENSP and will report directly to, or coordinate closely with, the ENSP. Monitoring will be conducted throughout each project area, including monitoring and management within unnourished portions of the project area, to offset adverse impacts to plovers and their habitat within areas receiving fill. Monitoring and management efforts will be consistent with the Service's (1994) *Guidelines for Managing Recreational*

Activities in Piping Plover Breeding Habitats on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act (Guidelines). A copy of the Guidelines is provided in Appendix B. The local monitor will provide on-site education and outreach to beach users; conduct endangered species surveys, monitoring, and management (including the use of symbolic fencing and predator exclosures as appropriate); and serve as a municipal liaison. Written summaries of nesting activity and management actions will be prepared and provided to the Corps, the Service, and other interested parties at the conclusion of each nesting season.

The Corps, ENSP, and Service will conduct biannual assessments of the monitoring program to re-evaluate the necessity of continued monitoring activities. The Corps and ENSP anticipate that the local municipalities will eventually assume and implement the majority of the piping plover management responsibilities and that the level of effort will remain the same as under the Corps-funded program. The ENSP will continue principal responsibility for conducting and overseeing piping plover monitoring for the foreseeable future (Jenkins, pers. comm., 2004).

Following construction or re-nourishment, beach management activities will be the responsibility of the local municipality or other appropriate landowner. To ensure the protection of federally listed species following project construction, the Corps will require the non-federal sponsor (NJDEP) to work with each municipality or other appropriate landowner to prepare site-specific endangered species management plans. Except as provided within an approved Section 10 Habitat Conservation Plan or otherwise authorized by the Service, all management plans and protective measures will be consistent with the Service's Guidelines. Plans will be implemented under the guidance of the Service, the ENSP, and the Corps. The management plans will describe site-specific protective measures for piping plover, including: establishment of protective zones; restrictions on beach raking, beach maintenance, and other municipal activities; actions to reduce impacts to the local plover population from predators and humans; and other management as appropriate for individual site conditions.

g. Habitat Enhancement

Design features have been incorporated into the Corps environmental restoration projects at Stone Harbor Point and Lower Cape May Meadows to enhance habitat for beach nesting birds. Flooding of nests has decreased piping plover productivity at Stone Harbor Point in recent years. The Stone Harbor restoration project will increase the elevation of the berm and create 67 acres of piping plover nesting habitat and approximately 15 acres of bayside intertidal foraging habitat. The project will be configured to include two berm “fingers,” each surrounded on three sides with intertidal flats to mimic naturally occurring tidal spits and intertidal sluices. Natural coastal processes will be allowed to reshape the area, providing potential "washover" habitats favored by piping plovers and other beach nesting birds.

Features were incorporated into the Lower Cape May Meadows project to retain or create optimal piping plover habitat while protecting sensitive wetlands behind the dunes. These features, developed in conjunction with ENSP, the Service, and The Nature Conservancy, will provide the plovers with alternate nesting and feeding habitat within the project area. The “forward” beach berm within The Nature Conservancy-owned portion of the Lower Cape May

Meadows project was constructed and will be maintained at a lower design elevation to more closely match existing elevations and allow for periodic overwash to encourage the development of alternate feeding habitat (*i.e.*, wet swales, storm-fed tidal pools) forward of the existing dune. If periodic overwash does not prove to be an effective means of creating this alternate feeding habitat, the Corps will coordinate prior to renourishment events to determine the feasibility of creating alternative piping plover feeding areas. The Corps is committed to providing these alternate feeding areas and will continue to coordinate with the Service, ENSP, and The Nature Conservancy to ensure that the final design protects and enhances piping plover habitat.

h. Measures Specific to Townsends Seawall Project

Rock material for the Townsends Inlet seawall project will be stockpiled on the beach berm adjacent to the Avalon terminal groin during no more than one piping plover nesting season. To minimize disturbance to adjacent nesting habitat, the Corps will establish a fence extending in a straight line from the existing access path fence line and connecting to the Avalon terminal groin. All work activity associated with transfer of materials from the stockpile will occur within this established fenced area to avoid degrading adjacent suitable nesting habitat.

Depending on site conditions at the time of construction, piping plovers could potentially nest closer than 100 meters from the stockpile. If nesting activity occurs within 100 meters of the stockpile, the Corps will cease all active use of the stockpile until after all chicks from the site have fledged. If nesting activity occurs greater than 100 meters from the stockpile, use of the stockpile may continue provided a piping plover construction monitor is present during any active use of the stockpile from March 15 to August 15. Motorized vehicle use within the fenced beach area will be suspended until all chicks from the site have fledged. Materials may be withdrawn from the stockpile from the inlet side of the groin by transporting materials across the groin or along the groin and provided no disturbance to nesting or foraging adults or chicks occurs from the materials handing procedures. If disturbance to piping plovers is observed from project-related activities, the activity will be suspended until all plover chicks have fledged.

At completion of the project and prior to a second piping plover nesting season, the stockpile area will be restored to sandy beach habitat to the extent possible. The stockpile area and adjacent beach currently contains rubble and debris from the old failed terminal groin. The Corps will remove all geotextile fabric from the site. All unused stockpiled materials from the seawall project will be completely removed from the site. The surface of the fenced stockpile area will be scraped to remove the old rock or rubble materials from the failed terminal groin, to a depth up to 2 feet. The scraped materials will be piled against the new terminal groin.

9. Conservation Measures to Protect Seabeach Amaranth

a. Surveys

Prior to project construction, a Corps biologist, contracted biologist/botanist or designated representative will survey the project area within the seabeach amaranth growing season (May 1 – November 1) to document the presence or absence of seabeach amaranth. The survey method

will provide adequate coverage of potential seabeach amaranth habitat in the work area. The surveyor will be kept apprized of construction schedules to ensure that surveys have been completed within any areas where work will commence within the next 2 weeks. If seabeach amaranth is observed, the project construction engineer, the Corps project biologist, and the Service will be notified immediately in order to determine necessary protective actions.

b. Monitoring and Protection of Seabeach Amaranth Plants

In the event that seabeach amaranth is found within a project area, information including plant locations, numbers of plants and size of plants will be recorded and provided to the Service and NHP. A procedure will be established to ensure that the monitor can make timely notification to the project construction engineer, and Corps and Service representatives, if seabeach amaranth is observed within the construction area. Following notification by the monitor, the project construction engineer will ensure that on-site contractors are notified immediately and activities adjusted or halted to avoid or minimize any immediate threat to seabeach amaranth. The monitor and project construction engineer will then confer with the Corps project biologist and the Service to establish permanent procedures to protect the species.

If construction personnel or vehicles are active in proximity to the site or might transit the site, symbolic fencing will be erected, encompassing a 3-meter protective buffer around the plant(s). The buffers will be adjusted as necessary to protect the plants and, where appropriate, will be combined into a single larger buffer area to better accommodate larger numbers of seabeach amaranth plants.

All construction activities will avoid any delineated locations of seabeach amaranth to the greatest practicable extent. Construction activities include, but are not limited to, staging, surveying, operation, and sand transport activities. The Corps will undertake all practicable measures to avoid damaging or destroying seabeach amaranth by avoiding areas where the species is present.

c. Restoration of Seabeach Amaranth Areas Likely to be Destroyed

In the event that seabeach amaranth becomes established within a project site, and an unavoidable nourishment or other activity will likely encroach upon and smother plants or otherwise destroy plants, the Corps will undertake actions to restore a population of similar size to the affected site. Actions to be taken will depend on the number of plants to be affected and the season of disturbance and will be determined following close coordination with the Service. Actions will include one or more of the following techniques, depending on the circumstances at the time of the construction or operations and maintenance event.

(1) Transplantation of Plants

Individual plants that would be covered with sand, or that occur where impacts from construction equipment cannot be avoided, will be transplanted to a similar habitat near or within the project area. Transplantation will include removal of a sufficiently large and intact volume of sand to

include the full extent of the roots. When necessary, transplanting will occur as soon as possible after the plant is identified, and every attempt will be made to include the entire (undamaged) root system.

(2) Seed Collection

When possible, seeds from plants to be translocated will be harvested prior to plants being moved. If no seed is collected on-site, a portion of the transplanted plants will be sent to a qualified greenhouse and propagated to produce seed. A portion of the seed will be stored under controlled conditions to be later replanted within the project area, including nourished areas. A portion of the seed shall be sent to or retained by a qualified greenhouse for germination. Successfully germinated plants will be replanted in suitable habitats in the project area, including nourished sites. These plants will be monitored to determine the species ability to re-colonize under various conditions for future mitigation efforts. The Philadelphia District Corps will also coordinate with the New York District Corps to determine the success rate of conservation measures implemented at New York District project sites to develop consistent and effective restoration methods for seabeach amaranth at renourishment sites.

The Service understands that this action, when feasible, will be undertaken for individual plants whose destruction cannot otherwise be avoided. Seed collection and replanting will be attempted as a means of mitigating such loss, but will not be construed as a long-term commitment or research responsibility on the part of the Corps.

(3) Stockpiling Sand Substrate

If translocation or seed collection is not a viable alternative, or has been proven ineffective, construction will be avoided around the plant and buffer area until individual plants die back. The top layer of sand substrate, including the plant site and the surrounding 3-meter buffer area, will be “scraped” and stockpiled. After the area has been graded to the design profile, the stockpiled “scraped sand” will then be re-spread within the project area in an area with suitable habitat conditions for seabeach amaranth.

d. Long-term Management

If seabeach amaranth is found within the project area, the appropriate municipal endangered species management plan(s) will be amended to include site-specific protective measures for this species. Such measures will include establishment of protective zones, restrictions on beach raking, fencing to prevent damage from vehicle and pedestrian use, monitoring, and other management as appropriate for individual site conditions.

IV. SPECIES STATUS

Relevant biological and ecological information considered by the Service in formulating this Biological Opinion is presented below. Appropriate information on the species life histories, habitats, distribution, and other factors affecting species survival is included to provide background for analyses in later sections. This section also documents the effects of past human and natural activities or events that have led to the current status of the piping plover and seabeach amaranth.

A. PIPING PLOVER

1. Species Description

Piping plovers are small, sand-colored shorebirds, approximately 17 centimeters (cm) (7 inches) long with a wingspread of about 38 cm (15 inches) (Palmer, 1967). On January 10, 1986, the piping plover was listed as endangered and threatened pursuant to the ESA. Protection of the species under the ESA reflects the species precarious status range-wide. Three separate breeding populations have been identified, each with its own recovery criteria: Atlantic Coast (threatened), Great Lakes (endangered), and Northern Great Plains (threatened). The Atlantic Coast population, which is the focus of this Biological Opinion, breeds on sandy, coastal beaches from Newfoundland to North Carolina, and winters along the Atlantic Coast from North Carolina south, along the Gulf Coast to Texas, and in the Caribbean (U.S. Fish and Wildlife Service, 1985). On July 10, 2001, the Service designated Critical Habitat for wintering piping plovers, including areas used by wintering plovers from the Atlantic Coast population. Critical Habitat was also designated in the Great Lakes breeding area on May 7, 2001, and proposed for the Northern Great Plains breeding area on June 12, 2001 (U.S. Fish and Wildlife Service, 2001a). No Critical Habitat has been designated or proposed in the Atlantic Coast breeding area.

The recovery plan for the Atlantic Coast population of the piping plover (U.S. Fish and Wildlife Service, 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 (see Table 2). Attainment of these goals for each recovery unit is an integral part of a piping plover recovery strategy that seeks to reduce the probability of extinction for the entire population by: (1) contributing to the population total, (2) reducing vulnerability to environmental variation (including catastrophes, such as hurricanes, oil spills, or disease), (3) increasing likelihood of genetic interchange among subpopulations, and (4) promoting re-colonization of any sites that experience declines or local extirpations due to low productivity or temporary habitat succession.

Table 2. Comparison of Piping Plover Population Estimates and 10-Year Average Productivity with Recovery Criteria by Recovery Unit[1]
(U.S. Fish and Wildlife Service, 2004a)

Recovery Unit	2003 Population Estimate (Number of Breeding Pairs)	Minimum Subpopulation Needed for Recovery (Number of Breeding Pairs)	2003 Population Estimate as Percent of Recovery Goal (%)	Average Productivity 1994-2003 (Number of Chicks Fledged per Pair)	Percent of Breeding Population 1994-2003 on which Productivity Estimate is Based (%)	Average Productivity Needed for Recovery (Number of Chicks Fledged per Pair)
Atlantic Canada	256	400	64.0	1.62	67.5	1.5
New England	687	625	109.9	1.44	98.1	1.5
New York-New Jersey	530	575	92.2	1.19	88.4	1.5
Southern	203	400	50.8	1.17	90.5	1.5
U.S. Total	1,420	1,600	88.8	1.32	93.6	1.5
Atlantic Coast	1,676	2,000	83.8	--	--	1.5

1 Final 2004 and 2005 Atlantic coast piping plover population information not yet available

The plan further 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." In accordance with the Endangered Species Consultation Handbook (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1998), since recovery units have been established in an approved recovery plan, this Biological Opinion considers the effects of the proposed project on piping plovers in the New York-New Jersey Recovery Unit, as well as the Atlantic Coast population as a whole.

2. Life History

Piping plovers begin returning to their Atlantic Coast nesting beaches in mid-March (Coutu *et al.*, 1990; Cross, 1990; Goldin, 1990; MacIvor, 1990; Hake 1993). Males establish and defend territories and court females (Cairns, 1982). Piping plovers are monogamous, but usually shift mates between years (Wilcox, 1959; Haig and Oring, 1988; MacIvor, 1990), and less frequently between nesting attempts in a given year (Haig and Oring, 1988; MacIvor, 1990; Strauss, 1990).

Plovers are known to begin breeding as early as 1 year of age (MacIvor, 1990; Haig, 1992); however, the percentage of birds that breed in their first adult year is unknown.

Piping plover nests can be found above the high tide line on coastal beaches, on sand flats at the ends of sand spits and barrier islands, on gently sloping foredunes, in blowout areas behind primary dunes, and in washover areas cut into or between dunes. The birds may also nest on areas where suitable dredge material has been deposited. Nest sites are shallow, scraped depressions in substrates ranging from fine-grained sand to mixtures of sand and pebbles, shells or cobble (Bent, 1929; Burger, 1987; Cairns, 1982; Patterson, 1988; Flemming *et al.*, 1990; MacIvor, 1990; Strauss, 1990). Nests are usually found in areas with little or no vegetation although, on occasion, piping plovers will nest under stands of American beachgrass or other vegetation (Patterson, 1988; Flemming *et al.*, 1990; MacIvor, 1990). Plover nests may be very difficult to detect, especially during the 6- to 7-day egg-laying phase when the birds generally do not incubate (Goldin, 1994).

Eggs may be present on the beach from early April through late July. Clutch size for an initial nest attempt is usually four eggs, one laid every other day. Eggs are pyriform in shape, and variable buff to greenish brown in color, marked with black or brown spots. The incubation period usually lasts 27-28 days. Full-time incubation usually begins with the completion of the clutch and is shared equally by both sexes (Wilcox, 1959; Cairns, 1977; MacIvor, 1990). Eggs in a clutch usually hatch within 4 to 8 hours of each other.

Piping plovers generally fledge only a single brood per season, but may renest several times if previous nests are lost. Chicks are precocial (Wilcox, 1959; Cairns, 1982). They may move hundreds of meters from the nest site during their first week of life (U.S. Fish and Wildlife Service, 1994), and chicks may increase their foraging range up to 1,000 meters before they fledge (are able to fly) (Loegering, 1992). Chicks remain together with one or both parents until they fledge at 25 to 35 days of age. Depending on date of hatching, flightless chicks may be present from mid-May until late August, although most fledge by the end of July (Patterson, 1988; Goldin, 1990; MacIvor, 1990; Howard *et al.*, 1993).

Cryptic coloration is a primary defense mechanism for this species; nests, adults, and chicks all blend in with their typical beach surroundings. Chicks sometimes respond to vehicles and/or pedestrians by crouching and remaining motionless (Cairns, 1977; Tull, 1984; Goldin, 1993; Hoopes, 1993). Adult piping plovers also respond to intruders (avian and mammalian) in their territories by displaying a variety of distraction behaviors, including squatting, false brooding, running, and injury feigning. Distraction displays may occur at any time during the breeding season but are most frequent and intense around the time of hatching (Cairns, 1977).

Plovers feed on invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks (Bent, 1929; Cairns, 1977; Nicholls, 1989). Important feeding areas include intertidal portions of ocean beaches, washover areas, mudflats, sand flats, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, or salt marshes (Gibbs, 1986; Coutu *et al.*, 1990; Hoopes *et al.*, 1992; Loegering, 1992; Goldin, 1993; Elias-Gerken, 1994). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs, 1986;

Coutu, *et al.* 1990; McConnaughey *et al.*, 1990; Loegering, 1992; Goldin, 1993; Hoopes, 1993, Elias-Gerken, 1994), and by stage in the breeding cycle (Cross, 1990). Adults and chicks on a given site may use different feeding habitats in varying proportion (Goldin, 1990). Feeding activities of chicks are particularly important to their survival. Most time budget studies reveal that chicks spend a high proportion of their time feeding. Cairns (1977) found that piping plover chicks typically tripled their weight during the first 2 weeks post-hatching; chicks that failed to achieve at least 60 percent of this weight gain by the twelfth day were unlikely to survive.

During courtship, nesting, and brood rearing, feeding territories are generally contiguous to nesting territories (Cairns, 1977), although instances where brood-rearing areas are widely separated from nesting territories are not uncommon. Feeding activities of both adults and chicks may occur during all hours of the day and night (Burger, 1993), and at all stages in the tidal cycle (Goldin, 1993; Hoopes, 1993).

Migration patterns are poorly understood. Most piping plover surveys have focused on breeding or wintering sites. Northward migration occurs during late February, March and early April, and southward migration extends from late July to August and September. Both spring and fall migration routes are believed to occur primarily within a narrow zone along the Atlantic Coast (U.S. Fish and Wildlife Service, 1996a).

3. Status on the Atlantic Coast and in the New York-New Jersey Recovery Unit

a. Historical Population Trends

Historical population trends for the Atlantic Coast piping plover have been reconstructed from scattered, largely qualitative records. Nineteenth-century naturalists, such as Audubon and Wilson, described the piping plover as a common summer resident on Atlantic Coast beaches (Haig and Oring, 1987). However, by the beginning of the 20th Century, egg collecting and uncontrolled hunting, primarily for the millinery trade, had greatly reduced the population, and, in some areas along the Atlantic Coast, the piping plover was close to extirpation. Following passage of the Migratory Bird Treaty Act (40 Stat. 775; 16 U.S.C. 703-712) in 1918, and changes in the fashion industry that no longer exploited wild birds for feathers, piping plover numbers recovered to some extent (Haig and Oring, 1985).

Available data suggest that the most recent population decline began in the late 1940s or early 1950s (Haig and Oring, 1985). Starting in 1972, the National Audubon Society's “Blue List” of birds with deteriorating status included the piping plover (Tate, 1981). Johnsgard (1981) described the piping plover as “... declining throughout its range and in rather serious trouble.” The Canadian Committee on the Status of Endangered Wildlife in Canada designated the piping plover as "Threatened" in 1978 and elevated the species status to "Endangered" in 1985 (Canadian Wildlife Service, 1989).

Reports of local or statewide declines between 1950 and 1985 are numerous and many are summarized by Cairns and McLaren (1980) and Haig and Oring (1985). While Wilcox (1939) estimated more than 500 pairs of piping plovers on Long Island, New York, the 1989 population

estimate was 191 pairs (U.S. Fish and Wildlife Service, 2004a). There was little focus on gathering quantitative data on piping plovers in Massachusetts through the late 1960s because the species was commonly observed and presumed to be secure. However, numbers of piping plover breeding pairs declined 50 to 100 percent at seven Massachusetts sites between the early 1970s and 1984 (Griffin and Melvin, 1984). Further, recent experience of biologists surveying piping plovers has shown that counts of these cryptically colored birds sometimes go up with increased census effort; suggesting that some historic counts of piping plover numbers by one or a few observers, who often recorded occurrences of many avian species simultaneously, may have underestimated the piping plover population. Thus, the magnitude of the species decline may have been more severe than available numbers imply.

b. Population Trends Since Listing Under the Endangered Species Act

Table 3 summarizes nesting pair counts for the Atlantic Coast piping plover population since listing in 1986 through 2003. Final range-wide numbers for the 2004 and 2005 breeding seasons are not yet available (U.S. Fish and Wildlife Service, 2004a).

The apparent increase in numbers of pairs between 1986 and 1989 (Table 3) is thought, at least partially, to reflect the effects of increased survey efforts following the proposed listing in 1985. Intensified survey effort may have played an important role in population estimates for New York and New Jersey. For example, Wich (1993) surmised that, although protection of beach nesting birds in New York increased after 1983, survey effort also intensified, especially at sites such as Breezy Point, Queens County, and Westhampton Beach, Suffolk County. While the relative contributions of each cannot be determined, he believes that “the stability of more recent [early 1990s] estimates probably accurately reflects the status of New York's plover population.” Ducey-Ortiz *et al.* (1989) documented an increasing plover monitoring effort in New York between 1984 and 1988 and found that, when results from 54 uniformly monitored sites were analyzed, the population trend did not increase or decrease significantly. The New Jersey plover coordinator conjectured that one quarter to one third of the apparent population increase observed in that State between 1987 and 1989 was due to increased survey effort (Jenkins, 1993).

The Atlantic Coast population increased from 957 pairs in 1989 to 1,676 pairs in 2003, but the increase has been unevenly distributed. Between 1989 and 2003, the New England subpopulation increased by 481 pairs, while the New York-New Jersey subpopulation gained only 211 pairs. The Southern and Atlantic Canada subpopulations lagged even further behind, with gains of only 4 pairs and 23 pairs, respectively (U.S. Fish and Wildlife Service, 2004a). While rapid overall population growth between 1991 and 1995, driven largely by the New England subpopulation, was encouraging, growth in the later half of the decade was more modest, with an essentially flat population trend from 1997 to 2000 (Hecht, pers. com., 2004). The New York-New Jersey subpopulation experienced a net decrease of 45 pairs between 1996 and 1998, followed by several years of steady gains accounting for a net increase of 192 nesting pairs (greater than 50 percent increase) over a 6-year period (1998-2003) (U.S. Fish and Wildlife Service, 2004a).

Table 3. Summary of Atlantic Coast Piping Plover Population Estimates, 1986 to 2003

STATE/REGION	NUMBER OF NESTING PAIRS																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	GOAL
Maine	15	12	20	16	17	18	24	32	35	40	60	47	60	56	50	55	65	61	
New Hampshire	0	0	-	-	-	-	-	-	-	-	-	5	5	6	6	7	7	7	
Massachusetts	139	126	134	137	140	160	213	289	352	441	454	483	495	501	496	495	538	511	
Rhode Island	10	17	19	19	28	26	20	31	32	40	50	51	46	39	49	52	58	71	
Connecticut	20	24	27	34	43	36	40	24	30	31	26	26	21	22	22	32	31	37	
NEW ENGLAND	184	179	200	206	228	240	297	376	449	552	590	612	627	624	623	641	699	687	625
New York	106	135	172	191	197	191	187	193	209	249	256	256	245	243	289	309	369	386	
New Jersey	102	93	105	128	126	126	134	127	124	132	127	115	93	107	112	122	138	144	
NY-NJ REGION	208	228	277	319	323	317	321	320	333	381	383	371	338	350	401	431	507	530	575
Delaware	8	7	3	3	6	5	2	2	4	5	6	4	6	4	3	6	6	6	
Maryland	17	23	25	20	14	17	24	19	32	44	61	60	56	58	60	60	60	59	
Virginia	100	100	103	121	125	131	97	106	96	118	87	88	95	89	96	119	120	114	
North Carolina	30	30	40	55	55	40	49	53	54	50	35	52	46	31	24	23	23	24	
South Carolina	3	-	--	-	1	1	-	1	-	-	0	-	-	-	-	0	-		
SOUTHERN REGION	158	160	171	199	201	194	172	181	186	217	189	204	203	182	183	208	209	203	400
U.S. TOTAL	550	567	648	724	752	751	790	877	968	1150	1162	1187	1168	1156	1207	1280	1415	1420	1600
EASTERN CANADA	240	223	238	233	229	234	234	234	181	208	186	197	212	240	231	245	275	256	400
ATLANTIC COAST	790	790	886	957	981	985	1024	1111	1149	1358	1348	1384	1380	1396	1438	1525	1690	1676	2000

c. Productivity

Productivity needed to maintain a stationary population for Atlantic Coast piping plovers is estimated at 1.24 fledged chicks per pair (Melvin and Gibbs, 1994). Small populations may be highly vulnerable to extinction due to variability in productivity and survival rates; therefore, the average productivity for a stationary population may be insufficient to assure a high probability of species survival (see discussion of effects of productivity rates on vulnerability to extinction below). To compensate for small populations, the recovery plan establishes productivity goals needed to assure a secure 2,000-pair population at 1.5 chicks per pair in each of the four recovery units, based on data from at least 90 percent of each recovery unit's population.

Table 4 provides a summary of piping plover productivity from 1994 to 2003. The 10-year (1994-2003) average productivity for piping plovers in the U.S. Atlantic Coast portion of their range is 1.32 chicks per pair. Peak productivity in the U.S. was observed in 1994 and 1999 when average productivity approached or exceeded the recovery plan productivity goal of 1.5 chicks per pair. However, productivity in 1997, 2000, and 2003 was considerably lower, 1.16, 1.17, and 1.24 chicks per pair, respectively, and well below or just reaching the 1.24 chicks per pair required to maintain a stationary population (U.S. Fish and Wildlife Service, 2004a). While weather events were major contributors to egg and chick losses in these years (U.S. Fish and Wildlife Service, 1998; 2002b), such periodic natural events are inevitable, and they underscore the need to reduce the species vulnerability by increasing the breeding population and protecting the species against human caused factors that impinge on productivity.

Table 4. Summary of Piping Plover Productivity Estimates for the U.S. Atlantic Coast, 1994-2003

	AVERAGE YOUNG FLEDGED PER PAIR										
STATE/REGION	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**1994 to 2003 AVG**
Maine	2.00	2.38	1.63	1.98	1.47	1.63	1.60	1.98	1.40	1.28	1.69
New Hampshire	-	-	-	0.60	2.40	2.67	2.33	2.14	0.14	1.00	1.58
Massachusetts	1.80	1.62	1.35	1.33	1.50	1.60	1.09	1.49	1.14	1.26	1.40
Rhode Island	2.00	1.68	1.56	1.34	1.13	1.79	1.20	1.50	1.95	1.03	1.48
Connecticut	1.47	1.35	1.31	1.69	1.05	1.45	1.86	1.22	1.87	1.30	1.45
NEW ENGLAND	1.81	1.67	1.40	1.39	1.46	1.62	1.18	1.53	1.26	1.24	1.44
New York	1.34	0.97	1.14	1.36	1.09	1.35	1.11	1.27	1.62	1.15	1.26
New Jersey	1.16	0.98	1.00	0.39	1.09	1.34	1.40	1.29	1.17	0.92	1.07
NY-NJ REGION	1.25	0.97	1.07	1.02	1.09	1.35	1.19	1.28	1.49	1.07	1.19
Delaware	2.50	2.00	0.50	1.00	0.83	1.50	1.67	1.50	1.17	2.33	1.46
Maryland	2.41	1.73	1.49	1.02	1.30	1.09	0.80	0.92	1.85	1.56	1.36
Virginia	1.65	1.00	1.54	0.71	1.01	1.21	1.42	1.52	1.19	1.90	1.33
North Carolina	0.36	0.45	0.86	0.23	0.61	0.48	0.54	0.50	0.17	0.46	0.46
SOUTHERN REGION	1.37	1.06	1.34	0.68	0.99	1.04	1.09	1.22	1.27	1.63	1.17
U.S. TOTAL	1.56	1.35	1.30	1.16	1.27	1.45	1.17	1.40	1.34	1.24	1.32
EASTERN CANADA	1.25	1.69	1.72	2.10	1.84	1.74	1.47	1.77	1.18	1.62	1.62

Mirroring the regional population trends, productivity rates have been unevenly distributed, with other recovery units lagging substantially behind New England. Average productivity from 1994 to 2003 in the New York-New Jersey Recovery Unit was 1.19 chicks per pair. In the New York-New Jersey Recovery Unit, over the past 10 years the 1.24 chicks per pair productivity needed to maintain a stationary population has been attained only four times, in 1994, 1999, 2001, and 2002. In addition, productivity estimates for this recovery unit reflect a gap between the number of pairs for which productivity is monitored and the total breeding population, with the 10-year average based on productivity data from only 88 percent of the total. Nearly all pairs in the recovery unit for which productivity is unknown nested in New York (U.S. Fish and Wildlife Service, 2004a).

d. Habitat Utilization

A growing body of information shows that overwash habitats, including bayside flats, unstabilized and recently closed inlets, ephemeral pools (areas on the beach where sea and/or rain water pooled during storm overwashes and rains), and moist, sparsely vegetated barrier flats, are especially important to piping plover productivity and carrying capacity in the New England, New York-New Jersey, and Southern Recovery Units (Wilcox, 1959; Strauss, 1990; Massachusetts Division of Fisheries and Wildlife, 1996; Jones, 1997).

Research indicates that plovers utilizing New England beaches are attracted to, and highly productive on, a wider variety of habitats (Massachusetts Division of Fisheries and Wildlife, 1996; Jones, 1997) than in the other recovery units in the southern half of their range. However, studies in the New England Recovery Unit also recognize the optimal value of overwash habitats with open connections to bayside foraging habitats. Out of 80 piping plover nests observed by Strauss (1990), no nests were found seaward of steep foredunes in Sandy Neck, Massachusetts, where this habitat constituted 83 percent of the beach front. Many areas in Strauss's study site had been artificially plugged with discarded Christmas trees and/or sand fences.

Goldin and Regosin (1998) found significantly higher chick survival and overall productivity among chicks with access to salt pond “mudflats” than those limited to oceanside beaches at Goosewing Beach, Rhode Island. Goldin and Regosin (1998) also reported that broods on the pondshore spent significantly less time responding to human disturbance (1.6 percent) than those limited to the ocean beach (17.0 percent). Since ocean beaches are highly attractive to recreational beachgoers, limiting plovers to these habitats may also increase the potential for disturbance from people and pets.

In New York, Wilcox (1959) described the effects on piping plovers of storms that breached the Long Island barrier islands in 1931 and 1938, forming Moriches and Shinnecock Inlets and leveling dunes across the south shore. Only three to four pairs of piping plovers nested on 27.4 kilometers (km) (17 miles) of barrier beach along Moriches and Shinnecock Bays in 1929. However, following the natural opening of Moriches Inlet in 1931, plover numbers increased to 20 pairs in 3.2 km (2 miles) of beach habitat by 1938. In 1938, a hurricane opened Shinnecock Inlet and also flattened dunes along both Shinnecock and Moriches Bays. In 1941, plover numbers along the same 27.4-km (17-mile) stretch of beach peaked at 64 pairs. Numbers then

gradually decreased, a decline that Wilcox (1959) attributed to deposition of dredged sand to rebuild dunes, planting of beachgrass, and construction of roads and summer homes.

A 1992-1993 study of nest site selection on 90 km (55.8 miles) of beach on Jones Beach Island, Fire Island, and Westhampton Island, New York (Elias *et al.*, 2000) found that all 1-km beach segments with ephemeral pools or bay tidal flats were used for nesting and brood rearing, whereas less than 50 percent of beach segments without these habitats were used. When the amount of time that plover broods used each habitat was compared with its availability, broods preferred ephemeral pools on segments where pools were present. Where present, bay tidal flats and wrack were the most preferred habitats. On segments with neither ephemeral pools or bay tidal flats, wrack was the most preferred habitat, and open vegetation was the second most preferred. Indices of arthropod abundance were highest on ephemeral pools and bay tidal flats. Chick peck rates were highest on ephemeral pools, bay tidal flats, and the ocean intertidal zone. To assist piping plover recovery, the authors recommend avoidance of beach management practices (*e.g.*, jetty construction, breach filling, dune building, sand renourishment) that typically inhibit natural renewal of ephemeral pools, bay tidal flats, and open vegetation.

In New Jersey, Burger (1994) studied plover foraging behavior and habitat use at ocean, dune, and back bays. The primary focus of that study was the effect of human disturbance on habitat selection. Results showed that both habitat selection and foraging behavior correlated inversely with the number of people present. In the absence of people, plovers fed in ocean and bayside habitats. Burger concluded that protection of the entire beach ecosystem with high habitat diversity will help mitigate effects of human beach recreation.

During the 2000 nesting season, Service biologists observed that 7 of the 21 sites (33 percent) occupied by nesting plovers in New Jersey were areas with low recreational use and access to ephemeral pools and/or bayside tidal flats. These 7 sites supported 58 percent (65 pairs) of the 112 piping plover pairs nesting in New Jersey in 2000 and accounted for 62 percent of the Statewide productivity (97 of 157 chicks fledged) (U.S. Fish and Wildlife Service, 2001b).

At the North Brigantine Natural Area in New Jersey, changes in piping plover nesting numbers have shown a correlation with changing habitat conditions. The North Brigantine Natural Area was subject to severe erosion in the early 1990s, and no plovers nested between 1990 and 1994. In the winter of 1994-1995, a series of nor'easters created a short-lived shallow inlet from the ocean to a tidal lagoon (Widgeon Bay) that later transformed to several meandering channels, overwashing the beach and stripping vegetation. The piping plover population at this site grew from a single pair in 1995 to 15 pairs in 2002. Through 2002, plover breeding activity was concentrated almost entirely at the overwash area, which comprised less than a third of the approximately 2.5-mile-long Natural Area beach. With active management of both predators and off-road-vehicle use, the North Brigantine site was also highly productive, fledging an average of 1.74 chicks per pair during the 8-year period. In 2003, the population increased to a total of 17 pairs distributed over a larger portion of the site, but productivity declined markedly. A decrease in overwash events at the North Brigantine Natural Area in recent years has resulted in revegetation of the site and has improved fox denning and hunting habitat, although flooding

during early season storms has also contributed to nest losses (Hecht, pers. comm., 2003; Jenkins, pers. comm., 2003).

On Assateague Island, Maryland, dramatic increases in productivity and breeding population occurred in response to overwash events between 1991 and 1992 on the northern 8 km of the island. Productivity, which had averaged 0.77 chicks per pair in a 5-year period before the overwash, averaged 1.67 chicks per pair from 1992 to 1996 following the overwash events. The nesting population also grew rapidly, doubling by 1995, and tripling by 1996, when 61 pairs nested there (MacIvor, 1990). Loegering and Fraser (1995) found that chicks on Assateague Island, which were able to reach bay beaches and the island interior, had significantly higher fledging rates than those that foraged solely on the ocean beach. The observed higher foraging rates, percentage of time spent foraging, and abundance of terrestrial arthropods on the bay beach and interior island habitats supported their hypothesis that foraging resources in interior and bayside habitats are key to reproductive rates on that site. Loegering and Fraser (1995) stressed the importance of sparsely vegetated cross-island access routes maintained by overwash, and the need to restrict or mitigate activities that reduce natural disturbance resulting from storms.

In Virginia, Watts *et al.* (undated) found that piping plovers nesting on 13 barrier islands in 1986-88 were not evenly distributed along the islands. Beach segments used by plovers had wider and more heterogeneous beaches, fewer stable dunes, greater open access to bayside foraging areas, and closer proximity to mudflats. Watts *et al.* (undated) noted that the characteristics of beaches selected by plovers are maintained by storms.

Further south at Cape Lookout National Seashore, North Carolina, 32 to 39 pairs of plovers nested on North and South Core Banks each year since 1992. While these unstabilized barrier islands total 70.4 km (44 miles) in length, nesting distribution is extremely patchy, with all nests clustered on the highly dynamic ends of the barrier islands, recently closed and sparsely vegetated "old inlets," expansive barrier mudflats, or new ocean-to-bay overwashes (Cape Lookout National Seashore, 1998). During a 1990 study, 96 percent of brood observations were on bay tidal flats, even though broods had access to both bay and ocean beach habitats (McConnaughey *et al.*, 1990).

4. Continuing Threats

Continuing threats to Atlantic Coast piping plovers in the breeding portion of their range include habitat loss and degradation, disturbance by humans and pets, increased predation, and oil spills. These threats are described within the revised recovery plan (U.S. Fish and Wildlife Service, 1996a), and discussion here is largely limited to the specific situation in the New York-New Jersey Recovery Unit. Many recent protective efforts in New York and New Jersey have been funded by revenues collected to restore oil spill damages (see below), and long-term funding for future protection efforts is uncertain.

a. Predation

As noted in the revised recovery plan (U.S. Fish and Wildlife Service, 1996a) substantial evidence exists that human activities are exacerbating natural predation on piping plovers, their eggs, and chicks. Where Wilcox (1959) had observed 92 percent hatching success of nests observed between 1939-58 on Long Island, New York, and loss of only 2 percent of nests to crows (*Corvus* sp.), Elias-Gerken (1994) documented loss of 21 percent of nests in her study area to crows in 1992-93. Elias-Gerken (1994) also observed crows perching and nesting in exotic Japanese black pines (*Pinus thunbergii*) along the Ocean Parkway on Jones Island, and hypothesized that this vegetation and other artificial perches exacerbated depredation by crows. Other important predators of plover eggs and chicks in the recovery unit include foxes (*Vulpes vulpes*), raccoons (*Procyon lotor*), Norway rats (*Rattus norvegicus*), herring gulls (*Larus argentatus*), great black-backed gulls (*Larus marinus*), domestic and feral dogs (*Canis familiaris*) and cats (*Felis silvestris*), and ghost crabs (*Ocypode quadrata*) (Riepe, 1989; Jenkins and Nichols, 1994; Jenkins *et al.*, 1999a; Canale, 1997; U.S. Fish and Wildlife Service, 1996a). Predators accounted for over half of all piping plover nest losses in New Jersey from 1995 to 1998 (Jenkins *et al.*, 1999a; Jenkins and Niles, 1999).

A variety of techniques that have been employed to reduce predation on plovers are discussed in the revised recovery plan (U.S. Fish and Wildlife Service, 1996a). Some of these techniques, most notably the use of predator exclosures (fences around nests), have been used with demonstrated success to reduce predation on piping plover eggs (Melvin *et al.*, 1992; Rimmer and Deblinger, 1990) and credited with an important role in population increases in some parts of their range (Jenkins and Nichols, 1994; Jenkins *et al.*, 1999a). However, these same devices have also been associated with serious problems including entanglements of birds in the exclosure netting and attraction of “smart” predators that have “learned” there is potential prey inside. The downside risks may include not only predation or nest abandonment, sometimes at rates exceeding those that might occur without exclosures, but also induced mortality of adult birds. Exclosures provide no protection for mobile plover chicks, which generally leave the exclosure within 1 day of hatching and move extensively along the beach to feed.

While plovers have derived important benefits from use of exclosures in the New York-New Jersey Recovery Unit (Jenkins and Nichols, 1994; Jenkins *et al.*, 1999a; Canale, 1997), the incidence of problems associated with these devices has been especially prevalent. At the Arverne site in Queens, New York for example, vandalism of exclosures has been a substantial problem (Davis, 1997; 1998). In 1995, foxes keyed in on exclosures at Westhampton Dunes, New York, causing high rates of abandonment. Trapping and removal of foxes at this site in 1996 and 1997 helped facilitate higher productivity (Houghton *et al*., 1997). At Sandy Hook, New Jersey, where exclosures had made important contributions to productivity between 1990 to 1996, heavy predation on exclosed and unexclosed nests was the major cause of a precipitous drop in productivity from 1.49 chicks per pair (1990-1996 average) to 0.36 chicks per pair in 1997 (McArthur, 1997).

b. Oil Spills

Oil and "tar balls" from the June 1990 discharge of 267,000 gallons of number 6 fuel oil from the B.T. Nautilus spill in the Kill Van Kull were found on southern Long Island beaches from Breezy Point to Fire Island, and along the New Jersey coastline from Sandy Hook south to Brigantine. Evidence submitted in government claims for natural resource damages included direct visual confirmation of 27 oiled piping plovers, 10 in New York and 17 in New Jersey. Implementation of piping plover restoration plans using funds collected from the responsible party was completed in New Jersey (1995-1999) and in New York (1997-2001).

The May 1996 ANITRA spill discharged 42,000 gallons of light crude oil into Delaware Bay and spread oil along more than 70 miles of the southern New Jersey coastline. Oiling was detected on 51 adult plovers, nine of which were captured and cleaned (New Jersey Department of Environmental Protection, U.S. Department of the Interior, and National Oceanic and Atmospheric Administration, 1999). The ANITRA oil spill is considered a contributing factor to the decline in New Jersey's piping plover population observed from 1996 to 1998. Using funds collected from the responsible party for natural resource damages, implementation of piping plover restoration activities on nesting areas impacted by the ANITRA spill is scheduled to begin during the 2005 nesting season.

In April 2003, the Bouchard No. 120 (B120) fuel barge apparently struck bottom in Buzzards Bay, Massachusetts and released approximately 55,000 gallons of No. 6 fuel oil through an 11 to 12-inch fracture in its hull. Within 24 hours, an oil slick approximately 10 miles long and 2 miles wide was observed in the Bay. The spill continued to spread, affecting approximately 90 miles of shoreline in and beyond Buzzards Bay. Approximately 26 extant or historic piping plover beaches were located within the area affected by the B120 oil spill. Of these 26 beaches, piping plovers were documented to have nested at 13 sites in 2003, of which 12 were oiled and subjected to clean-up activities. Over 60 oiled plovers were documented and up to 55 pairs of plovers could have been affected by the oil and response activities. A natural resources damage assessment is underway (von Oettingen, pers. comm., 2004).

c. Disturbance from Humans, Pets, and Motorized Vehicles

Intensive management measures to protect piping plovers from disturbance by beach recreationists and their pets have been implemented at many New York-New Jersey plover nesting sites in recent years. In 2003, more than half of the occupied piping plover nesting sites in New Jersey were located on State or private land (18 out of 30 sites) (Jenkins and Pover, 2003). In New York, 92 percent of piping plover pairs nested on non-federal land in 2003 (Hecht, pers. comm., 2004). Piping plover protection in this recovery unit, therefore, is highly dependent on the efforts of State and local government agencies, conservation organizations, and private landowners. Landowner efforts are often contingent on annual commitments. While many landowners are supportive and cooperative, others are not.

Recreational activities can be a source of both direct mortality and harassment of piping plovers. Pedestrians may flush incubating plovers from nests (Flemming *et al.*, 1988; Cross, 1990; Cross

and Terwilliger, 1993), exposing eggs to predators or excessive temperatures. Repeated exposure of shorebird eggs on hot days may cause overheating, killing the embryos (Bergstrom, 1991); excessive cooling may kill embryos or retard their development, delaying hatching dates (Welty, 1982). Pedestrians can also displace unfledged chicks (Strauss, 1990; Burger, 1991; Loegering, 1992; Hoopes, 1993; Goldin, 1993), forcing them out of preferred habitats, decreasing available foraging time, and causing expenditure of energy.

Concentrations of pedestrians may deter piping plovers from using otherwise suitable habitat. In Jones Beach Island, New York, Elias-Gerkin (1994) found less pedestrian disturbance in areas selected by nesting piping plovers than areas unoccupied by plovers. Burger (1991; 1994) found that presence of people at several New Jersey sites caused plovers to shift their habitat use away from the ocean front to interior and bayside habitats, and that the time plovers devoted to foraging decreased and the time spent alert increased when more people were present. Burger (1991) also found that when plover chicks and adults were exposed to the same number of people, chicks spent less time foraging and more time crouching, running away from people, and being alert then did adult birds.

Fireworks are highly disturbing to piping plovers (Howard *et al.*, 1993). Plovers are also intolerant of kites, particularly as compared to pedestrians, dogs, and vehicles. Biologists believe this may be because plovers perceive kites as potential avian predators (Hoopes, 1993).

Motorized vehicle use on beaches is a threat to piping plovers. Vehicles can crush eggs, adults, and chicks (Wilcox, 1959; Tull, 1984; Burger, 1987; Patterson *et al.*, 1991). In Massachusetts and New York, 18 piping plover chicks and 2 adults were killed by off-road vehicles (ORVs) in 14 documented incidents (Melvin *et al*., 1994). Goldin (1993) compiled records of 34 chick mortalities (30 on the Atlantic Coast and 4 on the Northern Great Plains) due to vehicles. Biologists that monitor and manage piping plovers believe that vehicles kill many more chicks than are found and reported (Melvin *et al.*, 1994).

Beaches used by recreational vehicles during nesting and brood-rearing periods generally have fewer breeding plovers than available nesting and feeding habitat can support. In contrast, plover abundance and productivity has increased on beaches where recreational vehicle restrictions during chick-rearing periods have been combined with protection of nests from predators (Goldin, 1993). Beginning in 1999 at the North Brigantine Natural Area, Atlantic County, New Jersey, a seasonal closure to all motorized vehicles was imposed during the period when unfledged chicks are present. The number of nesting pairs of piping plovers at this site rose from eight pairs in 1998 to 11 pairs in 2000; productivity rose from 1.50 chicks per pair in 1998 to a State record of 3.17 chicks per pair in 1999, with 2.45 chicks fledged per pair in 2000 (Jenkins *et al.*, 1998; Jenkins *et al.*, 1999b; Jenkins, 2000).

Once hatched, piping plover broods are mobile and may not remain near the nesting area. Wire fencing placed around nests to deter predators (Rimmer and Deblinger, 1990; Melvin *et al.*, 1992) is ineffective in protecting chicks from vehicles because chicks typically leave the nest within a day after hatching and move extensively along the beach to feed. Typical behaviors of piping plover chicks increase their vulnerability to vehicles. Chicks frequently move between

the upper berm or foredune and feeding habitat within the wrack line and intertidal zone. These movements place chicks in the paths of vehicles driving along the berm or through the intertidal zone. Chicks stand, walk, and run along tire ruts, and sometimes have difficulty crossing deep ruts or climbing out of them (Eddings *et al.*, 1990; Strauss, 1990; Howard *et al.*, 1993). Chicks sometimes stand motionless or crouch as vehicles pass by, or do not move quickly enough to get out of the way (Tull, 1984; Hoopes *et al.*, 1992; Goldin, 1993).

Vehicles also significantly degrade piping plover habitat or disrupt normal behavior patterns by crushing wrack into the sand and making it unavailable as cover or a foraging substrate (Hoopes, *et al.* 1992; Goldin, 1993). Additionally, vehicles create ruts that can trap or impede movements of chicks and may prevent plovers from using habitat that is otherwise suitable (MacIvor, 1990, Strauss, 1990; Hoopes *et al.*, 1992; Goldin, 1993; Hoopes, 1994). Vehicles that are driven too close to the toe of the dune may destroy vegetation that may also provide piping plover habitat (Elias-Gerken, 1994).

While removal of human-created trash on the beach is desirable to reduce predation threats, the indiscriminate nature of mechanized beach-cleaning adversely affects piping plovers and their habitat. In addition to the danger of directly crushing piping plover nests and chicks and the prolonged disturbance from the machine's noise, this method of beach-cleaning removes the birds' natural wrack line feeding habitat (Eddings and Melvin, 1991; Howard *et al.*, 1993), and shell fragments, a preferred feature of nesting habitat.

d. Habitat Loss and Degradation

While loss and degradation of habitat have been major contributors to the rangewide decline of the piping plover (U.S. Fish and Wildlife Service, 1996a), this threat is especially prominent in the New York-New Jersey Recovery Unit. Within the New York Bight, which includes the species entire range in New Jersey and the southern Long Island shoreline, more than half the beaches are classified as "developed" (U.S. Fish and Wildlife Service, 1997). The remaining beaches in the New York Bight, classified as “natural and undeveloped,” enjoy some protection from development through the Coastal Barrier Resources Act's (96 Stat. 1653; 16 U.S.C. 3501 *et seq*.) limitations on federal assistance and flood insurance. However, many of these areas are also subject to extensive stabilization activities that promote the formation of mature dunes, thus preventing overwash, inlet migration, and other natural coastal processes that create and maintain optimal plover habitat.

The beaches on the south shore of Long Island are affected by a variety of federal and non-federal management activities including inlet management, beach nourishment, dune construction, and dune stabilization. There are six inlets stabilized by hard structures along the barrier chain system from Montauk Point west to Rockaway Inlet. Within this stretch, multiple groin fields also exist. Gilgo Beach and Jones Beach on Jones Island, and Robert Moses State Park on Fire Island have been artificially nourished during the course of several Corps projects (see below). Dune construction and beach nourishment are implemented almost entirely to protect developments on the barrier island or mainland by reducing the potential for breaches and overwashes. Over the last 40 years, all major barrier island breaches have been artificially

closed. Artificial plantings of American beachgrass and other species such as Japanese black pine, as well as the erection of sand fencing, are used to promote the formation of large, heavily vegetated dunes, thus reducing the potential for breaches and overwashes.

From 1986 to the present, the Corps has formally consulted with the Service's New York and Long Island Field Offices under the interagency ESA regulations for nine beach nourishment or navigation project activities between Jones Inlet and Montauk Point within the New York - New Jersey Recovery Unit. Biological Opinions (issuance date given in parentheses) were prepared for the following Corps projects:

(1) Shinnecock Inlet Reformulation Project (December 1986);
(2) Fire Island Inlet and Shore Westerly to Jones Inlet Combined Navigation and Beach Erosion Control Project (May 1987);
(3) 30-year Westhampton Interim Storm Damage Protection Project (December 1994);
(4) 3-year Breach Contingency Plan (BCP) (July 1995);
(5) Fire Island Inlet and Shore Westerly to Jones Inlet Combined Navigation and Beach Erosion Control Project, Seabeach Amaranth Transplantation Program (May 1995);
(6) 15-year Shelter Island, New York, Erosion Control Project (June 1995; revised October 1997);
(7) 6-year West of Shinnecock Interim Storm Damage Protection Project (2001);
(8) Fire Island Pines Maintenance Dredging Project (2003); and
(9) Fire Island Short-term Community Storm Surge Protection Plan (2003).

The Service has also conducted informal Section 7 consultations with the Corps for many projects in the New York portion of the New York-New Jersey Recovery Unit. For navigation projects, consultations are conducted at various frequencies to be consistent with the Corps channel maintenance schedules. Maintenance occurs from every 1 to 3 years up to 10 years, depending on shoaling rates and funding availability. Recent informal consultations include:

(1) Long Beach Island Beach Erosion Control (May 1994);
(2) Moriches Inlet Navigation Project (March 1996 and July 1998);
(3) Jones Inlet Jetty Rehabilitation Project (June 1995 and July 1998);
(4) Shinnecock Inlet Navigation Inlet Maintenance Dredging (July 1998 and October 2003);
(5) Fire Island Inlet and Shore Westerly to Jones Inlet Combined Navigation and Beach Erosion Control Project (June 1999; 2001; and October 2003);
(6) Gilgo Dune Ladder Demonstration Project (On-going),
(7) East Rockaway Shore Protection Project (1999; On-going);
(8) Long Island Intracoastal Channel Project (May 2002; On-going); and
(9) Atlantic Coast Monitoring Program (February 2002).

Of approximately 200 km (125 miles) of Atlantic coastline in New Jersey, stretching from Sandy Hook to Cape May, all but approximately 21 km (13 miles) (Sandy Hook Unit, Gateway

National Recreation Area and Little Beach Island within the Edwin B. Forsythe National Wildlife Refuge) are encompassed within a Corps beach nourishment project area. Corps sponsored or permitted shore protection / restoration projects within the New Jersey portion of the New York-New Jersey Recovery Unit for which the Service completed Biological Opinions (issuance date given in parentheses) include the following:

(1) Stone Harbor Point (February 2001);
(2) Sections I and II of the Atlantic Coast of New Jersey Beach Erosion Control Project, Seabright to Manasquan (September 2002);
(3) Townsends Inlet to Hereford Inlet (September 2002);
(4) Cape May Inlet to Lower Township (December 2002);
(5) Lower Cape May Meadows – Cape May Point (April 2003); and
(6) Barnegat Inlet (July 2003).

The Service has also conducted informal consultation with the Corps for multiple shoreline protection projects within New Jersey. Authorized Corps navigation projects located within the New Jersey portion of the New York - New Jersey Recovery Unit for which informal consultation is on-going include:

(1) Shark River Inlet;
(2) Manasquan Inlet;
(3) Barnegat Inlet; and
(4) Cape May and Ocean City.

Within the 21 km of New Jersey shoreline excluded from Corps nourishment programs, an approximately 900-meter-long section of the Gateway National Recreation Area, Sandy Hook Unit is regularly renourished by the National Park Service (NPS). In May 2002, the NPS and the Service completed formal consultation for a 2002 renourishment of the Critical Zone. Previous fills were conducted in 1977, 1982-83, 1989-90, 1996-97, and 1997-98; the NPS has consulted with the Service regarding past fill projects in accordance with the ESA. In May 2005, the NPS and the Service completed formal consultation for long-term beach nourishment via a sand slurry pipeline that will “recycle” and transport sand from northern Sandy Hook to the Critical Zone on an annual cycle.

The above consultations are a part of the many Section 7 consultations that the Service performs for federal agency actions and do not reflect those undertaken by the Corps pursuant to Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act for State, local, or private beach nourishment or dredging activities. Ultimately, these projects accelerate the formation of mature dunes substantially reduce inlet creation and overwash that would otherwise form the sparsely vegetated, low-lying barrier beach habitats important to the piping plover. Under natural conditions, barrier beaches continually erode and accrete. Storms and high tides create overwash fans and flats behind and between dunes. Periodic breaches along barrier islands allow for the formation of new inlet areas, while accretion over time fills in inlets. The piping plover evolved in this highly dynamic ecosystem and has adapted to relocating its nesting sites in response to natural coastal processes. As dune or back beach sites become established in

accreting areas and vegetated through natural succession, these sites decline in habitat suitability for piping plovers.

Throughout much of the New York-New Jersey Recovery Unit, periodic beach nourishment has interfered with natural coastal processes by precluding formation of newly forming inlets, overwash zones, and accreting beach habitats that would create, replace, or revitalize piping plover nesting and foraging habitats.

5. Vulnerability to Extinction

The Atlantic Coast piping plover recovery plan (U.S. Fish and Wildlife Service, 1996a) provides a discussion of the demographic and genetic factors that were used to assess the species vulnerability to extinction. A population viability analysis was conducted to estimate probabilities of extinction, as well as probabilities that populations of various sizes and rates of fecundity would fall below thresholds of 50, 100, and 500 pairs during the next 100 years. The modeled scenario that most closely approximated the current status of the Atlantic Coast population (*i.e.*, 1,500 pairs with average productivity of 1.25 chicks per pair) showed an extinction probability of 31 percent over 100 years. In addition, the model showed a 95 percent probability of the population dropping below 500 pairs during the same period.

While the scenario described above is based on survival rates observed in a 1985-1989 Massachusetts study, modeling also showed that even small drops in survival rates could very substantially increase the risk of extinction. Such long-term declines in survival rates could occur due to continuing declines in availability or quality of wintering or migration habitats, increased human disturbance on wintering grounds, increased mortality due to disease, parasites, or environmental contaminants, increased predation, or reduced longevity or fitness due to unforeseen genetic factors. When declines in adult and chick survival rates of just 5 percent and 10 percent, respectively, were modeled for a 1,500-pair population with average fecundity of 1.5 chicks per pair (far above the 1994-2003 U.S. Atlantic coast average of 1.24 chicks per pair), the extinction probability increased from 9 percent to 40 percent, and the probability that population size would drop below 500 pairs increased from 44 percent to 97 percent.

The assessments of continuing vulnerability to extinction based on modeling, described above, are validated by empirical data from 1986-2003 coast-wide population and productivity monitoring. For example, the nearly flat population trend between 1995 to 1996, following 1995 productivity of 1.35 chicks per pair (well above the estimated rate needed to maintain a stationary population) and productivity of 1.47 and 1.56 chicks per pair in 1993 and 1994, respectively, suggest that survival rates may have been lower in 1995 and 1996 than in preceding years. While fluctuations in survival rates are to be expected, their occurrence provides vivid illustration of the inherent vulnerability of such small populations.

Another graphic demonstration of the Atlantic Coast piping plover's continued precarious status is provided by the population trend in New Jersey. A 44 percent population increase in the State population, from 93 pairs in 1987 to 137 pairs in 1992, was followed by a flat trend between 1993 and 1995. The New Jersey population then dropped precipitously over the next 2 years,

returning to 1987 levels by 1998, when only 93 pairs were counted in the State. Despite the intensive protection efforts, productivity in the New York - New Jersey Recovery Unit since listing (1986 to 2003) has been below that needed to maintain a stationary population in all but 4 years.

The overall probability of extinction for the Atlantic Coast piping plover population is exacerbated by the fact that increases in productivity and abundance during the 1990s were largely attributable to the New England Recovery Unit (see Tables 3 and 4). In contrast, populations of the other three recovery units have leveled off or increased more slowly, although the increase of 76 pairs of plovers observed in 2002 within the New York - New Jersey Recovery Unit is encouraging. Ten-year productivity in New York - New Jersey and the Southern Recovery Units remains low (see Tables 3 and 4). The uneven distribution of population gains across recovery units increases overall vulnerability to catastrophes (such as oil spills or disease). It also leaves the population vulnerable if a hiatus in the occurrence of large storms should lead to a decline in habitat conditions in the New England portion of the range.

The New York - New Jersey Recovery Unit provides a vital link between the New England and Southern subpopulations. Available information demonstrates slow rates of dispersal between subpopulations (U.S. Fish and Wildlife Service, 1996a). Movements of birds (adults or chicks) between recovery units are few, and movement large enough to span the distance between nonadjacent recovery units has never been documented. Thus, loss or even near extirpation of the New York - New Jersey Recovery Unit could acutely destabilize the population by isolating the Southern Recovery Unit, thereby forestalling exchange of breeding birds and genetic material across more than half the species range.

An additional consideration relevant to vulnerability of piping plovers in the New York - New Jersey Unit lies in the duration of a species exposure to a given risk of extinction. Any activity that extends a species vulnerability to extinction by substantially suppressing the carrying capacity of the species habitat or by prolonging periods of low productivity and/or survival appreciably increases the species cumulative likelihood of extinction. Recovery objectives are designed to reduce a species extinction risk by increasing its numbers, productivity, and distribution. Rapid progress towards recovery objectives reduces a species exposure to a given extinction risk in the same way that facilitating health improvements in a weak organism decreases risk from factors such as disease or environmental deterioration. Conversely, perpetuating low numbers increases a species long-term exposure to a higher likelihood of extinction[2]. This is of particular concern in the New York - New Jersey Recovery Unit because of the shortage of high quality habitats, pervasive threats from human disturbance and predation, and dependence on intensive management to mitigate these threats.

[2] Consider, for example, a species with an annual extinction risk of 1% (0.01). The cumulative risk of extinction over 10 years is 10% (and, conversely probability of persistence for 10 years is 90%). If ceasing a practice that degrades habitat decreases probability of extinction each year by 10% (to 0.9% in year 2, 0.8% in year 3, etc.), then the risk of extinction over 10 years decreases to 6% (probability of persistence for 10 years is 94%).

B. SEABEACH AMARANTH

In 1993, seabeach amaranth was added to the List of Endangered and Threatened Wildlife and Plants as a threatened species. The listing was based upon the elimination of seabeach amaranth from two-thirds of its historic range, and continuing threats to the 55 populations that remained at the time (U.S. Fish and Wildlife Service, 1993).

1. Species Description

a. Physical Description

Seabeach amaranth is an annual plant and a member of the Amaranth family (Amaranthaceae). Upon germination, the plant initially forms a small, unbranched sprig, but soon begins to branch profusely, forming a low-growing mat. Seabeach amaranth's fleshy stems are prostrate at the base, erect or somewhat reclining at the tips, and pink, red, or reddish in color. The leaves of seabeach amaranth are small, rounded, and fleshy, spinach-green in color, with a characteristic notch at the rounded tip. Leaves are approximately 1.3 to 2.5 cm in diameter, and clustered towards the tip of the stem (Weakley and Bucher, 1992). The foliage of seabeach amaranth turns deep red in the fall (Snyder, 1996). Plants often grow to 30 cm in diameter, consisting of 5 to 20 branches, but occasionally reach 90 cm in diameter, with 100 or more branches. Flowers and fruits are inconspicuous, borne in clusters along the stems. Seeds are 2.5 millimeters (mm) in diameter, dark reddish-brown, and glossy, borne in low-density, fleshy, indehiscent utricles (bladder-like seed capsules or fruits), 4 to 6 mm long (Weakley and Bucher, 1992). The seed does not fill the utricle, leaving an air-filled space (U.S. Fish and Wildlife Service, 1996b).

b. Habitat

Seabeach amaranth is native to Atlantic coast barrier island beaches from Massachusetts to South Carolina. The species primary habitat consists of overwash flats at accreting ends of barrier islands, and lower foredunes and upper strands of non-eroding beaches. This species occasionally establishes small, temporary, and casual populations in secondary habitats including sound side beaches, blowouts in foredunes, and sand or shell dredge spoil or beach nourishment material (Weakley and Bucher, 1992).

Seabeach amaranth occupies a narrow beach zone that lies at elevations from 0.2 to 1.5 m above mean high tide, the lowest elevations at which vascular plants regularly occur. Seaward, the plant grows only above the high tide line, as it is intolerant of even occasional flooding during the growing season. Landward, seabeach amaranth does not occur more than a meter or so above the beach elevation on the foredune, or anywhere behind it, except in overwash areas. The species is, therefore, dependent on a terrestrial, upper beach habitat that is not flooded during the growing season. This zone is absent on beaches that are experiencing high rates of erosion. Seabeach amaranth is never found on beaches where the foredune is scarped by undermining water at high or storm tides (Weakley and Bucher, 1992).

Seabeach amaranth usually occurs on a pure silica sand substrate, occasionally containing shell fragments. The U.S. Natural Resources Conservation Service classifies the habitat of seabeach amaranth as either Beach-Foredune Association or Beach (occasionally flooded). Seabeach amaranth habitat occurs within a wetland system classified by Cowardin *et al.* (1979) as Marine System, Intertidal Subsystem, Unconsolidated Shore Class (Weakley and Bucher, 1992).

The habitat of seabeach amaranth is sparsely vegetated with annual herbs and, less commonly, perennial herbs (mostly grasses) and scattered shrubs. The number and type of seabeach amaranth's vegetative associates have been found to vary with specific habitat type (*i.e.*, overwash flat, accreting barrier island end, or lower foredune) (Chicone, undated). The most constant associates of seabeach amaranth, with which the species almost always co-occurs, are sea rocket (*Cakile edentula*) and seabeach spurge (*Chamaesyce polygonifolia*) (Weakley and Bucher, 1992). Known vegetative associates of seabeach amaranth by State are given in Table 5.

Seabeach amaranth does not occur on well-vegetated sites, particularly where perennials have become strongly established (Weakley and Bucher, 1992). Pauley *et al.* (1999) documented a negative correlation between seabeach amaranth and several dominant foredune species. A particularly strong negative association has been reported between seabeach amaranth and beach grasses (*Ammophila* sp.) (U.S. Fish and Wildlife Service, 1996b). However, a positive correlation has been observed between seabeach amaranth and sea rocket, an annual (Hancock, 1995).

c. Biogeography and Range

Seabeach amaranth is limited by its habitat requirements to a very narrow strip of barrier islands and mainland oceanfront beach strands along the Atlantic coast. The original range of this species extended from Cape Cod in Massachusetts to central South Carolina, a stretch of coast approximately 1,600 km (994 miles) long. This stretch correlates with a geographic range of low tidal amplitude. Tidal amplitude and the relative importance of tidal versus wave energy in shaping coastal morphology are thought to limit the geographic range of seabeach amaranth, rather than availability of sandy beach substrates or sea water temperatures. The range of seabeach amaranth is characterized by islands developed by high wave energy, low tidal energy, frequent overwash, and frequent breaching by hurricanes with resulting formation of new inlets (Weakley and Bucher, 1992). Some authors have observed that seabeach amaranth tends to occur on south or southeast facing coasts (Weakley and Bucher, 1992; Snyder, 1996), but a range-wide analysis of beach orientation has not been conducted.

Table 5. Known Vegetative Associates of Seabeach Amaranth[1]

North Carolina and South Carolina (Weakley and Bucher, 1992)	sea rocket (*Cakile edentula*) seabeach spurge [seabeach sandmat, seaside sandmat] (*Chamaesyce* [*Euphorbia*] *polygonifolia*) beach elder (*Iva imbricata*) southern seabeach spurge [southern seabeach sandmat] (*Chamaesyce bombensis*) saltwort [common Russian thistle] (*Salsola tragus* [*australis*]) cordgrass (*Spartina patens*) sea oats (*Uniola paniculata*) bitter panic (*Panicum amarum*) shoreline seapurslane [sea-purslane] (*Sesuvium portulacastrum*) slender seapurslane [sea-purslane] (*Sesuvium maritimum*) seabeach orach [crested saltbush] (*Atriplex cristata* [*arenaria*]) seablite (*Suaeda linearis*) trailing wild bean [beach pea] (*Strophostyles helvula* [*helvola*]) beach morning glory (*Ipomoea imperati*) hog spurge (*Croton punctatus*) sand grass (*Triplasis purpurea*) American beachgrass [beach grass] (*Ammophila breviligulata*) seabeach knotweed [beach knotweed, seaside knotweed] (*Polygonum glaucum*)
Maryland (Ramsey *et al.*, 2000)	sea rocket American beachgrass beach clotbur [cocklebur] (*Xanthium echinatum*) seabeach spurge bitter panic seaside goldenrod (*Solidago sempervirens*)
Delaware (McAvoy, 2000)	American beachgrass sea rocket sanddune sandspur (*Cenchrus tribuloides*) seabeach spurge Russian thistle (*Salsola kali*) sand grass
New Jersey (U.S. Fish and Wildlife Service, 2002c)	sea rocket seabeach spurge Russian thistle American beachgrass clotbur seaside goldenrod goosefoot (*Chenopodium* sp.) crab grass (*Digitaria sanguinalis*) sand grass seabeach sandwort [sea sandwort, sea-purselane] (*Honkenya [Honckenya, Arenaria] peploides*) seabeach orach wild bean (*Strophostyles* sp.) seabeach knotweed
New York (U.S. Fish and Wildlife Service, 1996b)	sea rocket seabeach spurge seabeach orach halberd-leaf orache [spear saltbush, spear saltweed, seabeach orach] (*Atriplex patula*) Russian thistle seabeach sandwort beach wormwood (*Artemisia stelleriana*) American beachgrass seabeach knotweed narrowleaf goosefoot (*Chenopodium berlandieri* var. macrocalycium) beach pea (*Lathyrus japonicus*)

1 Common and scientific names were standardized using the Integrated Taxonomic Information System (http://www.itis.usda.gov/). Taxonomic synonyms, including those used in the source document, are provided in brackets.

Seabeach amaranth is considered globally rare (G2) by the New Jersey Natural Heritage Program. Historic records of seabeach amaranth are known from nine States. Largely due to human activities, the species was eliminated from seven of these States by the 1980s, remaining only in North and South Carolina. Seabeach amaranth is still considered extirpated from two States: Massachusetts and Rhode Island. Since 1990, the species has re-occupied five States from which it had previously been extirpated. Table 6 gives the dates of rediscovery and the last previously known occurrence of the plant in each State.

Table 6. Re-colonization Dates of Seabeach Amaranth in Five States

State	Date Rediscovered	Date of Last Previously Known Occurrence
New York	July 1990	1950 (Van Schoik and Antenen, 1993)
New Jersey	July 2000	1913 (U.S. Fish and Wildlife Service, 1996b)
Delaware	August 2000	1875 (McAvoy, 2000)
Maryland	August 1998	1967 (Ramsey *et al.*, 2000)
Virginia	September 2001	1973 (U.S. Fish and Wildlife Service, 1996b)

To date, theories of seabeach amaranth's return to the northern part of its range remain speculative. Sites in these five States may have been re-colonized by long-distance transport of seeds by wind or currents. At some sites, seeds may have been long buried in sediments used in beach nourishment projects. This hypothesis requires that seeds can remain viable after prolonged off-shore burial, an unknown factor. In Maryland's Assateague Island National Seashore, the NPS has allowed a previously stabilized foredune system to return to more natural conditions. This change in beach management, and the possible existence of a persistent seed bank, have been cited as factors in the species return to the area (Ramsey *et al.*, 2000).

The current known range of naturally occurring seabeach amaranth is Water Mill Beach on Long Island, New York to Debidue Beach in South Carolina (Young, 2001; Hamilton, 2000a). In 1999, seed and cultivated plants were transplanted to several sites south of Debidue Beach by the South Carolina Department of Natural Resources as part of a restoration program. The southernmost site in the restoration program was at Pritchards Island, approximately 200 km (124 miles) southwest of Debidue Beach (Hamilton, 2000a; 2000b), but (to date) plants are known to persist from the transplanted seed/cultivars only as far south as Otter Island, roughly 130 km (81 miles) southwest of Debidue Beach.

2. Life History

a. Life History Strategy

Seabeach amaranth occupies a highly specific and restricted niche as a "fugitive" species in the narrow upper beach zones of newly formed, accreting barrier island ends and non-eroding beach strands. A dynamic, early successional ("pioneer") species, seabeach amaranth is termed a "fugitive" because its populations are constantly shifting to newly disturbed areas. The plant is

eliminated from existing habitats by competition and erosion, and colonizes newly formed habitats by dispersal and (probably) long-lived seed banks. A poor competitor, seabeach amaranth is eliminated from sites where perennials have become established, probably because of root competition for scarce water and nutrient supplies (Weakley and Bucher, 1992). Seabeach amaranth acts as a capable sand binder (Weakley and Bucher, 1992), which is typical of pioneer beach plants. The species is not likely to be a young or recently evolved species, considering its isolation within the genus (it has no apparently close relatives) and its possession of numerous adaptations to the peculiar environment in which it grows (U.S. Fish and Wildlife Service, 1996b).

Seabeach amaranth habitat exists in dynamic conditions. The same physical forces (*e.g.*, storms, extreme high tides) that create the plant's very specific and ephemeral coastal habitat also destroy it. Existing habitat is eroded away, but new habitat is created by island overwash and breaching. Therefore, seabeach amaranth requires extensive areas of barrier island beaches and inlets, functioning in a relatively natural and dynamic manner. Such conditions allow the plant to move around in the landscape as a "fugitive" species, occupying suitable habitat as it becomes available (U.S. Fish and Wildlife Service, 1996b).

b. Density and Distribution

Density of seabeach amaranth is extremely variable within and between populations. The species generally occurs in a sparse to very sparse distribution pattern, even in the most suitable habitats. A typical density is 100 plants per linear km of beach, though occasionally on accreting beaches, dense populations of 1,000 plants per km can be found. Island-end sand flats generally have higher densities than oceanfront beaches (Weakley and Bucher, 1992). Comparing overwash flats, accreting barrier island ends, and lower foredunes, Chicone (undated) found that seabeach amaranth plants growing in foredune habitats tended to be larger, healthier, and have fewer associates. Seabeach amaranth has been found to have a strongly contagious (clumped) distribution (Hancock, 1995).

Within its primary habitats, seabeach amaranth tends to be concentrated in the line of wrack material deposited by high tides (Mangels, 1991; Weakley and Bucher, 1992; Hancock, 1995; McAvoy, 2000). Anecdotal observations from New Jersey and Maryland suggest that plants within the wrack line tend to be larger (U.S. Fish and Wildlife Service, 2002c). Pauley *et al.* (1999), however, found that plots centered on seabeach amaranth had a lower percent area covered by litter material than random plots, suggesting that litter material may be an advantageous microhabitat for seabeach amaranth only when it contains higher levels of organic material and moisture than bare sand, as in the wrack line.

c. Life Cycle and Phenology

Seabeach amaranth is an annual species. Individual plants live only one season, with only a single opportunity to produce seed. The species over-winters entirely as seeds. Germination of seedlings begins in April and continues at least through July. In the northern part of the range, germination occurs slightly later, typically late June through early August. Reproductive

maturity is determined by size rather than age, and flowering begins as soon as plants have reached sufficient size. Even very small plants can flower under certain conditions. Flowering sometimes begins as early as June in the Carolinas, but more typically commences in July and continues until the death of the plant. Seed production begins in July or August and reaches a peak in most years in September. Seed production likewise continues until the plant dies. Senescence and death occur in late fall or early winter (U.S. Fish and Wildlife Service, 1996b).

Seabeach amaranth seems capable of essentially indeterminate growth (Weakley and Bucher, 1992). However, predation and weather events, including rainfall, hurricanes, and temperature extremes, have significant effects on the length of the species reproductive season. As a result of one or more of these influences, the flowering and fruiting period can be terminated as early as June or July (U.S. Fish and Wildlife Service, 1993).

d. Reproduction

As an annual, seabeach amaranth reproduces solely by sexual reproduction by seed, with no vegetative or clonal form of reproduction. The species is monoecious (male and female flowers on the same plant), and, based on morphology of the flower and inflorescence, most likely wind pollinated. Seabeach amaranth is capable of self fertilization, an advantageous adaptation for a pioneer species, allowing the founding of a new colony by a single propagule. Self fertilization likely plays a large, probably dominant, role in seed production (Weakley and Bucher, 1992).

Once past the juvenile stage, seabeach amaranth flowers and fruits continuously until death or senescence. Late season plants may continue flowering and fruiting with few or no leaves, sometimes producing an aberrant, dense, terminal inflorescence (Weakley and Bucher, 1992). Even very small plants produce flowers under conditions of a short (12-hour) photoperiod (Jolls and Sellars, 2000), likely an opportunistic adaptation to permit small, late germinating plants to reproduce at the end of the growing season. Nearly all adult seabeach amaranth plants produce seeds, and fertility is assumed to be high (Weakley and Bucher, 1992). Fruit production is correlated with plant weight (Hancock, 1995), and large plants are estimated to produce several thousand fertile seeds over a fruiting season (Weakley and Bucher, 1992). Within the genus Amaranthus, this is a very low reproductive rate, but seabeach amaranth has apparently evolved a strategy of producing fewer, larger seeds than other members of its genus. Under favorable conditions, seabeach amaranth shows good reproductive success (Weakley and Bucher, 1992).

e. Seed Dispersal

Seabeach amaranth seeds are dispersed by a variety of mechanisms involving transport via wind and water. The fleshy tissues and air pocket of the utricle cause the fruit to have a lower density than the bare seed. Seeds retained in utricles are easily blown about, deposited in depressions, the lee behind plants, or in the surf. Naked seeds are also commonly encountered in the field, and are also dispersed by wind, but to a much lesser degree than seeds retained in utricles. Naked seeds tend to remain in the lee of the parent plant, or get moved to nearby depressions (Weakley and Bucher, 1992). Observations from South Carolina indicate that seabeach

amaranth seeds are also dispersed in the guts of birds, and deposited with their droppings (Hamilton, 2000b).

Many utricles remain attached to the parent plant and are never dispersed, leading to *in situ* "planting." This phenomenon has also been observed in sea rocket, and may be an adaptation to dynamic beach conditions. If conditions remain favorable at the site of the parent plant, the seed source for retention of that site is guaranteed. If conditions become unsuitable, other seeds have been dispersed to colonize new sites (Weakley and Bucher, 1992).

f. Germination

Fresh seabeach amaranth seeds are physiologically dormant (Baskin and Baskin, 1994; 1998). The tough seedcoat requires some physical modification before germination can occur. The primary mechanism(s) for breaking seed dormancy in the field is not known, but possible factors include abrasion, cold, imbibing of water, and gradual breakdown over time (Weakley and Bucher, 1992; Hamilton, 2000c; Jolls and Sellars, 2000; Hancock, 1995; Baskin and Baskin, 1994; 1998). Once dormancy is broken, light and high temperatures (25-35° C) are required for germination (Hancock, 1995; Baskin and Baskin, 1994; 1998). This high temperature requirement causes seabeach amaranth to germinate later in the season than other dune associates, and limits the time in which new seedlings can offset population mortality. Rainfall is also significant in promoting germination (Hancock, 1995).

Initial studies have found that seabeach amaranth seedlings cannot emerge from a depth of more than 1 cm (Hancock, 1995) or 2 cm (U.S. Fish and Wildlife Service, 2002c). Deeper (6 cm) burial suppresses germination and delays emergence (Jolls, *et al.*, 2001). Results of these studies, combined with the finding that light is required for germination, are strong evidence that deep burial may completely prevent germination and seedling emergence. Seabeach amaranth may have less opportunity to emerge and become established compared to other dune species such as sea rocket, as mean emergence of seedlings (growth rate of the newly sprouted seed) is less than predicted for the species seed mass (Hancock, 1995).

g. Natural Limiting Factors

Except where suitable habitat has persisted long enough for perennials to become established, the primary limiting factors of seabeach amaranth under natural conditions are abiotic. Abiotic limiting factors are expected for a fugitive species that occupies dynamic, early successional habitats. Weather is an important limiting factor, given the relatively narrow temperature and rainfall requirements for germination and seedling establishment. Flooding, drought, or unseasonable temperatures may impair seabeach amaranth survival and reproduction. Weather also limits abundance of the species through its effects on winds, which may cause burial of seeds and plants by sand. In addition to decreasing germination and seedling establishment, burial may also impact reproduction by covering adult plants prior to seed set. This effect was observed in South Carolina (Hamilton, 2000b), and may have occurred in New Jersey (Service observation) and Maryland (U.S. Fish and Wildlife Service, 2002c).

Coastal storms are probably the single most important natural limitation on the abundance of seabeach amaranth. Storms erode habitat and curtail the reproductive season due to flooding and overwash. However, storm events also permit the species to survive by creating new habitat, and by providing long-distance seed transport. Through these combined effects, storms largely determine the distribution of the species in the landscape. A patchy distribution may itself limit the abundance of seabeach amaranth; colonization of suitable habitats is hampered by long distances to the nearest seed source (Weakley and Bucher, 1992).

Under natural conditions, interspecific competition for water and nutrients, especially with perennials, is perhaps the only significant biotic limiting factor of seabeach amaranth. Weakley and Bucher (1992) cite intraspecific competition as a possible factor in the mortality of young plants, but Hancock (1995) found no evidence of intraspecific density effects. If intraspecific competition does limit seabeach amaranth abundance, its effects are likely small compared to the effects of competition with perennial species, which possess superior abilities to extract water and nutrients from the porous sand. Predators and disease are discussed below under threats.

3. Population Dynamics

a. Demography

Although the longevity of seabeach amaranth seeds is unknown, several lines of evidence suggest that seed banks may be an important factor in this species life history (Weakley and Bucher, 1992; Baskin and Baskin, 1998). The relative roles of fresh and banked seeds are unknown (U.S. Fish and Wildlife Service, 1996b). In experimental plots in Maryland, a few late-season seedlings emerged from the current year's seed crop (U.S. Fish and Wildlife Service, 2002c), however the contribution of same-season seed to the current year's population and seed crop is likely small.

For a sexually reproducing annual plant, natality is comprised of two components, the seed production rate (or fecundity) and the germination rate. Fecundity of seabeach amaranth under favorable conditions is generally considered high overall (thousands of seeds for a large plant), although reliable means of measuring this parameter in the field have yet to be developed (Jolls and Sellars, 2000). Based upon several laboratory studies, germination rates under favorable conditions are also high, 75-100 percent (Weakley and Bucher, 1992; Hancock, 1995; Jolls and Sellers, 2000; Baskin and Baskin, 1994; 1998).

Mortality rates of both fresh and banked seeds are unknown. More is known about mortality of the plants. Substantial mortality of young plants occurs in some years, prior to reproduction. Storm effects (*i.e.* flooding, overwash, erosion) during the early growing season or unfavorable weather conditions, such as drought, can substantially reduce survival to reproductive age (Weakley and Bucher, 1992). Hancock (1995) found only 7 percent survival of seedlings to 40 days of age, with mortality caused primarily by high tide flooding. Flooding resulted in almost 100 percent mortality of propagated plants at three of six experimental transplant sites in South Carolina in 1999. At a fourth site, drifting sand covered most of the transplants, with only 10 of 196 plants (about 5 percent) surviving to produce seed (Hamilton, 2000b). Burial by blowing

sand may have also affected reproduction in New Jersey and Maryland in 2000 (Service observation; U.S. Fish and Wildlife Service, 2002c). Unfavorable conditions early in the growing season, including drought, burial, and especially flooding and other storm damage, may reduce seed production by 90 percent (Weakley and Bucher, 1992) to 98 percent (Hancock, 1995).

Once past the stage of germination and early growth, mortality rates are generally lower. In the Carolinas, mortality of older plants tends to be caused primarily by webworm predation (Weakley and Bucher, 1992). Larger plants may be able to withstand saltwater inundation better than smaller plants; however, prolonged salt water inundation kills almost all plants, regardless of size (Hancock, 1995). Storms later in the growing season can effectively and abruptly curtail reproduction for the year (Weakley and Bucher, 1992). Plants that have not died from other causes senesce and die in late fall or early winter.

b. Genetic Variability

Preliminary results from two initial genetic studies of seabeach amaranth suggest that the species genetic variability is low. A study by Salisbury State University looked for genetic differences in nuclear DNA within and across three groups: propagated plants from Maryland, wild plants from Maryland, and wild plants from Delaware. Overall, genetic variability was found to be low. Wild and propagated Maryland plants were similar, as might be expected, since the propagated plants were produced from wild plants taken from the same area (U.S. Fish and Wildlife Service, 2002c). Higher levels of genetic variability were found within the sample of plants from Delaware. A second study by Strand (2002) analyzed non-coding regions of nuclear and chloroplast DNA taken from seed and dry leaf samples from New York, New Jersey, North Carolina, and South Carolina. To date, this study has found no observable genetic variation among any of the samples. Although the results of these two studies are consistent, these results must be interpreted with caution. Lack of detection does not prove a lack of genetic variability, which might be present in other regions of the genome, or detectable through other techniques (Jolls and Sellars, 2000; Strand, 2002; U.S. Fish and Wildlife Service, 2002c).

c. Population Size and Variability

As might be expected for a fugitive annual plant of dynamic barrier beach habitats, populations of seabeach amaranth at any given site are extremely variable (Weakley and Bucher, 1992). Population size at a site often fluctuates 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.

Because variability is so great, a single survey is a poor measure of a population's health. Assessing site-specific population trends is difficult even with several years of surveys. Weakley and Bucher (1992) suggest that a 5 to 10 year average is a more meaningful measure for

assessing the vigor of a local seabeach amaranth population. However long-term, consecutive, annual data are available for only a few sites in New York. Estimates of aggregated population sizes for seabeach amaranth across its range are imprecise, given available survey data. Early (pre-1987) survey data are limited. Range-wide surveys were conducted in 1987, 1988, and 1990 (excluding States where the species was considered extirpated at the time). Annual State-wide surveys have been conducted subsequently in New York, but no comprehensive surveys of North or South Carolina have been carried out since 1990. Suitable areas in New Jersey, Delaware, and Maryland were thoroughly surveyed in 2000, but these efforts did not necessarily extend State-wide. Approximately 14 locations in Virginia were surveyed in 2000. No seabeach amaranth was found (Belden, 2000; U. S. Fish and Wildlife Service, 2002c). In 2001, seabeach amaranth was found on Assateague Island, Virginia, most likely the result of a restoration program in Assateague Island National Seashore in Maryland (U.S. Fish and Wildlife Service 2002c). No recent surveys are known from Massachusetts or Rhode Island.

Comprehensive rangewide population information was last compiled for seabeach amaranth in 2000. An effort is under way to compile population data from 2001 to 2003, but is not yet complete (Eudaly, pers. comm., 2004). Table 7 presents the number of known extant sites and total plants from 1987 to 2000 (Chicone, undated; Weakley and Bucher, 1992; Snyder, 1996; Pauley *et al.*, 1999; Belden, 2000; Jolls and Sellars, 2000; McAvoy, 2000; Hamilton, 2000a; Young, 2001; National Park Service, 2001a; National Park Service, 2001b; U.S. Army Corps of Engineers, 2001b; U.S. Fish and Wildlife Service, 2002c). The level of survey effort (number of sites surveyed) varied widely from year to year. Timing of surveys and survey methodologies were likewise variable from site to site and year to year. The estimated total number of seabeach amaranth plants in 2000 was approximately 140,000 at 39 sites. This figure is almost certainly an underestimate, because many known sites were not surveyed. In 2000, only 30 of 41 known sites were surveyed in North Carolina, and only 3 of 16 known sites were surveyed in South Carolina (Jolls and Sellars, 2000; National Park Service, 2001a; National Park Service, 2001b; U.S. Army Corps of Engineers, 2001b; Hamilton, 2000a).

The term “extant” as used in Table 7 refers to a site or “population” with at least 1 plant documented during the growing season. Sites are not included in the totals given in Table 7 if the sites were not surveyed during a given year or if sites were surveyed but no plants were found. This later category is not necessarily considered extirpated. Because of natural population fluctuations, populations are not considered extirpated until several consecutive years of negative surveys and/or the habitat becomes strongly unsuitable.

The 2000 population of seabeach amaranth had an uneven geographic distribution, with almost 99 percent of the plants located on Long Island, New York. A single site on Long Beach Island, New York comprised 75 percent of the total plants range-wide. Of the 39 extant sites documented in 2000, 11 had 100 or more plants (7 in New York, 2 in New Jersey, and 2 in North Carolina), and 4 had 1,000 or more plants (all in New York). Seventeen sites had fewer than 10 plants (3 in New York, 1 in Maryland, 11 in North Carolina, and 2 in South Carolina) (Young, 2001; McAvoy, 2000; National Park Service 2001a; 2001b; Jolls and Sellars, 2000; U.S. Army Corps of Engineers, 2001b; Hamilton, 2000a; U.S. Fish and Wildlife Service, 2002c).

Table 7. Number of Documented Extant Seabeach Amaranth Sites and Total Plants, 1987-2000

		1987	1988	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
New York	# sites surveyed	-	-	10	12	12	18	14	18	12	16	22	22	19
	# extant sites	-	-	10	10	9	9	9	6	7	11	11	12	13
	total # plants	-	-	331	2,100	422	195	182	599	2,263	7,990	8,599	19,150	138,600
New Jersey	# sites surveyed	-	-	-	-	-	-	-	-	15	-	-	3	8
	# extant sites	-	-	-	-	-	-	-	-	0	-	-	0	4
	total # plants	-	-	-	-	-	-	-	-	0	-	-	0	1,019
Delaware	# sites surveyed	-	-	-	-	-	-	-	-	-	-	-	-	2
	# extant sites	-	-	-	-	-	-	-	-	-	-	-	-	2
	total # plants	-	-	-	-	-	-	-	-	-	-	-	-	41
Maryland	# sites surveyed	-	-	-	-	-	-	-	-	-	-	1	1	1
	# extant sites	-	-	-	-	-	-	-	-	-	-	1	1	1
	total # plants	-	-	-	-	-	-	-	-	-	-	2	1	4
North Carolina	# sites surveyed	35	40	40	4	14	21	20	21	19	21	20	29	30
	# extant sites	26	36	33	4	13	20	17	18	16	15	17	16	18
	total # plants	10,399	41,851	10,780	1,506	26,588	17,016	10,673	39,457	7,769	973	13,430	739	381
South Carolina	# sites surveyed	17	16	17	-	-	-	-	1	-	1	6	2	3
	# extant sites	12	8	9	-	-	-	-	1	-	1	56	0	2
	total # plants	1,341	1,800	188	-	-	-	-	84	-	77	406	0	4
TOTAL	# sites surveyed	52	56	67	16	26	39	34	40	46	38	50	57	77
	# extant sites	38	44	52	14	22	29	26	25	23	27	35	29	40
	total # plants	11,740	43,651	11,299	3,606	27,010	17,211	10,855	10,140	10,032	9,040	22,437	19,890	140,049

4. Status and Distribution

a. Reasons for Listing and Continuing Threats

(1) Habitat Loss and Degradation

The primary threats to seabeach amaranth are the adverse alterations of habitat caused by beach erosion and shoreline stabilization. Although seabeach amaranth does not persist on eroding beaches, erosion is not a threat to the continued existence of the species under natural conditions. Erosion in some areas is balanced with habitat formation elsewhere, such as accreting inlets and overwash areas, resulting in an equilibrium that allows the plant to survive by moving around in the landscape. In the geologic past, seabeach amaranth has persisted through even relatively rapid episodes of sea level rise and barrier island retreat. A natural barrier island landscape, even a retreating one, contains localized accreting areas, especially in the vicinity of inlets (U.S. Fish and Wildlife Service, 1996b).

Human alteration of the barrier island ecosystem generally tips the equilibrium between habitat destruction and creation in favor of destructive erosional forces. Erosion is accelerated in many areas by human-induced factors such as reduced sediment loads reaching coastal areas due to damming of rivers, and beach stabilization structures. When the shoreline is "hardened" by artificial structures (*e.g.* seawalls, bulkheads), overwash and inlet formation are curbed. Erosion may also be increasing due to sea level rise and increased storm activity caused by global climate change (U.S. Fish and Wildlife Service, 1993).

Although storms and erosion threaten seabeach amaranth, attempts to stabilize beaches against these natural processes are generally more destructive to the species and to the beaches themselves in the long term (U.S. Fish and Wildlife Service, 1993). Any stabilization of the shoreline is generally detrimental to a pioneer, upper beach annual, whose niche or "life strategy" is the colonization of unstable, unvegetated, new land, and which is unable to compete with perennial grasses (U.S. Fish and Wildlife Service, 1996b).

Attempts to halt beach erosion through hard structures (*i.e.*, sea walls, jetties, groins, bulkheads) appear invariably to destroy habitat for seabeach amaranth. In the Carolinas, seabeach amaranth is not found on shorelines where bulkheads, sea walls, or riprap zones have been constructed. Such armoring generally occurs in the primary habitat of the plant, and water and wind erosion lower the profile of the beach seaward of the armoring. The upper beach habitat required by seabeach amaranth (above inundation by tidal action) ceases to exist as the beach is steadily eroded. Groins have mixed effects on seabeach amaranth. Immediately upstream from a groin, accretion sometimes provides or maintains, at least temporarily, habitat for seabeach amaranth; immediately downstream, erosion usually destroys seabeach amaranth habitat. In the long term, groins (if they are successful) stabilize upstream beaches, allowing succession to perennials, and rendering even the upstream side only marginally suitable for seabeach amaranth. Widespread construction of sea walls, jetties, and other hard stabilization structures in New Jersey, New York, and other northern States is associated with the extirpation of seabeach amaranth from the

northern part of its range during the first part of the 20th Century (U.S. Fish and Wildlife Service, 1996b).

Even minor structures and non-structural beach stabilization techniques, such as sand fences and beachgrass planting, are generally detrimental to seabeach amaranth (U.S. Fish and Wildlife Service, 1993). Dune stabilization and vertical sand accretion caused by sand fences appear to be detrimental to seabeach amaranth and contradictory to its life history strategy. The effects of dune stabilization by planting vegetation are similar (U.S. Fish and Wildlife Service, 1996b). Seabeach amaranth only very rarely occurs when sand fences and vegetative stabilization have taken place and, in these situations, is present only as rare, scattered individuals or short-lived populations (Weakley and Bucher, 1992).

Beach nourishment can have positive site-specific impacts on seabeach amaranth. Although more study is needed before the long-term impacts can be accurately assessed, seabeach amaranth has colonized several nourished beaches, and has thrived in some sites through subsequent re-applications of fill material (U.S. Fish and Wildlife Service, 1993). However, on the landscape level, beach nourishment is similar to other beach stabilization efforts in that it stabilizes the shoreline and curtails the natural geophysical processes of barrier islands. These effects are detrimental to the range-wide persistence of the species. In addition, beach nourishment may cause site-specific adverse effects by crushing or burying seeds or plants, or by altering the beach profile or upper beach micro-habitats in ways not conducive to seabeach amaranth colonization or survival. Deeply burying seeds during any season can have serious effects on populations; this also applies to the placement of dredge spoil (U.S. Fish and Wildlife Service, 1996b). Burial of the seed bank may be particularly detrimental to isolated populations, as no nearby seed sources are available to re-colonize the nourished site. Adverse effects of beach nourishment may be compounded if accompanied by artificial dune construction and stabilization with sand fencing and/or beach grass, or if followed by high levels of erosion and scarping of the upper beach.

As a fugitive species dependent on a dynamic landscape and large-scale geophysical processes, seabeach amaranth is vulnerable to habitat fragmentation and isolation of small populations (U.S. Fish and Wildlife Service, 1993). Rendering 50 to 75 percent of a coastline “permanently” unsuitable may doom seabeach amaranth, because any given area will become unsuitable at some time due to natural forces. If a seed source is no longer available in the vicinity, seabeach amaranth will be unable to reestablish itself when the area once again provides suitable habitat. In this way, the species can be progressively eliminated even from generally favorable stretches of habitat surrounded by “permanently” unfavorable areas. Fragmentation of habitat in the northern part of the species range apparently led to regional extirpation during the last century. Areas of suitable habitat were separated from one another by distances too great to allow re-colonization following natural catastrophes (Weakley and Bucher, 1992).

As noted under the discussion of piping plover species status, New York and New Jersey beaches have been especially affected by past and ongoing habitat modification. New Jersey has the highest degree of shoreline stabilization of any State. As measured by the amount of shoreline in the totally stabilized category (90 to 100 percent “walled”), New Jersey, America’s

oldest developed shoreline, is 43 percent hard-stabilized (Pilkey and Wright, 1988). Although construction of new hard stabilization structures has slowed, the New Jersey Shore Protection Master Plan (New Jersey Department of Environmental Protection, 1981) documents the State's intent to maintain existing functional structures in many parts of New Jersey.

In addition, almost the entire ocean-front coastline of New Jersey, and much of New York, is included in current or proposed beach nourishment programs (see lists of projects under the piping plover section). Cumulatively, these nourishment projects significantly contribute to continued stabilization of the New York-New Jersey shoreline. In addition, multiple, simultaneous habitat disturbances increase the vulnerability of seabeach amaranth to declining habitat conditions, and to catastrophic events. The extreme degree of shoreline stabilization in New York and New Jersey, and the large-scale, long-term current and proposed beach nourishment programs designed to maintain the *status quo*, are particularly important given the recent seabeach amaranth population shift from south to north, discussed further below.

(2) Recreational Impacts

Intensive recreational use of beaches can threaten seabeach amaranth populations, both through direct damage and mortality of plants, and by impacting habitat. Light pedestrian traffic, even during the growing season, usually has little effect on seabeach amaranth (U.S. Fish and Wildlife Service, 1993). Substantive impacts generally occur only on narrow beaches, or beaches which receive heavy recreational use. In such areas, seabeach amaranth populations are sometimes eliminated or reduced by repeated trampling. While pedestrian traffic appears to be a minor problem in the Carolinas, the heavier traffic borne by northern beaches near major population centers may have been partially responsible for the past extirpation of seabeach amaranth in those regions (U.S. Fish and Wildlife Service, 1996b).

Off-road vehicle (ORV) use on the beach during the growing season can have detrimental effects on the species, as the fleshy stems of this plant are brittle and easily broken. Plants generally do not survive even a single pass by a truck tire (Weakley and Bucher, 1992). Sites where vehicles are allowed to run over seabeach amaranth plants often show severe population declines. Dormant season ORV use has shown little evidence of significant detrimental effects, unless it results in massive physical erosion or degradation of the site, such as compacting or rutting of the upper beach. In some cases, winter ORV traffic may actually provide some benefits for the species by setting back succession of perennial grasses and shrubs with which seabeach amaranth cannot compete successfully. However, extremely heavy ORV use, even in winter, may have some negative impacts, including pulverization of seeds (Weakley and Bucher, 1992).

Beach grooming, more common on northern beaches, may also have contributed to the previous extirpation of seabeach amaranth from that part of its range. Motorized beach rakes, which remove trash and vegetation from bathing beaches, do not allow seabeach amaranth to colonize long stretches of beach (U.S. Fish and Wildlife Service, 1996b). In New Jersey, plants were found along a nearly continuous length of beach, noticeably interrupted by stretches that are routinely raked.

(3) Herbivory

Predation by webworms (caterpillars of small moths) is a major source of mortality and lowered fecundity in the Carolinas, often defoliating plants by early fall (U.S. Fish and Wildlife Service, 1993). Defoliation at this season appears to result in premature senescence and mortality, reducing seed production, the most basic and critical parameter in the life cycle of an annual plant. Webworm predation may decrease seed production by more than 50 percent (Weakley and Bucher, 1992). In the Carolinas, four species of webworm collected from seabeach amaranth have been identified: beet webworm (*Loxostege similialis*), garden webworm (*Achyra rantalis*), southern beet webworm (*Herpetogramma bipunctalis*), and Hawaiian beet webworm (*Spoladea recurvalis*). In New York, herbivory by saltmarsh caterpillars (*Estigmene acraea*) has been observed (U.S. Fish and Wildlife Service, 1996b). Webworm herbivory of seabeach amaranth has not been documented in Delaware or Maryland.

Although the five webworms so far identified on seabeach amaranth are all native species, their use of barrier islands has probably been altered by changes in the coastal plain landscape (*i.e.*, extensive agricultural use), the development of barrier islands, and the introduction of weedy plants that can also serve as host plants. All five webworms are "weedy" species, probably much more abundant now than they were in pre-Columbian times. For this reason, the level of predation that seabeach amaranth is experiencing is likely unnaturally high (U.S. Fish and Wildlife Service, 1996b). Webworm herbivory is probably a contributing, rather than a leading factor in the decline of seabeach amaranth. However, in combination with extensive habitat alteration, severe herbivory could threaten the existence of the species (Weakley and Bucher, 1992).

(4) Utilization and Collection

Seabeach amaranth is generally not threatened by over-utilization or collection, as it does not have showy flowers, and is not a component of the commercial trade in native plants. However, because the species is easily recognizable and accessible, it is vulnerable to taking, vandalism, and the incidental trampling by curiosity seekers. Seabeach amaranth is an attractive and colorful plant, with a prostrate growth habit that could lend itself to planting on beach front lots. The species effectiveness as a sand binder could make it even more attractive for this purpose. In addition, seabeach amaranth is being investigated by the USDA and several universities and private institutes for its potential use in crop development and improvement. Over-collection and the development of genetically altered, domesticated varieties are potential, but currently unrealized, threats to the species (U.S. Fish and Wildlife Service, 1993).

b. New Threats

New threats to seabeach amaranth have been documented since the species was listed in 1993. These factors are lesser threats than habitat modification, but may increase the risk of extinction by compounding the effects of other, more severe threats.

Several additional herbivores of seabeach amaranth have been observed including deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), and migratory song birds (Van Schoik and Antenen, 1993), as well as feral horses in Maryland (U.S. Fish and Wildlife Service, 2002c). Hancock (1995) suggests that grasshoppers may feed on seabeach amaranth, but does not indicate whether this was actually observed. There is also strong circumstantial evidence for seabeach amaranth herbivory by grasshopper (U.S. Fish and Wildlife Service, 2002c). Minor insect damage was noted on a few New Jersey plants in 2000, and larval insects were observed feeding on seabeach amaranth in 2001; to date, no species have been identified. In addition, a cluster of New Jersey plants appeared to have been damaged by a congregation of loafing gulls (*Larus* spp.), based upon feathers and droppings. As with webworms, the abundance of these newly documented predators on barrier islands is increased by human activities.

Asiatic sand sedge (*Carex kobomugi*) has been suggested as another potential threat to seabeach amaranth. This sedge is strongly rhizomatous and dune-forming (National Park Service and Maryland Natural Heritage Program, 2000). Asiatic sand sedge was introduced to the east coast (New Jersey to Virginia) from east Asia in the 1930s for erosion control and as a sand stabilizer. The species is known to crowd out native dune species (Virginia Department of Conservation and Recreation and Virginia Native Plant Society, undated). Asiatic sand sedge may be detrimental to seabeach amaranth by direct competition, and by reducing habitat suitability through sand stabilization and dune building.

The first known disease of seabeach amaranth was documented in South Carolina in 2000. During the 2000 growing season, an oomycete (*Albugo* sp.) was observed on seabeach amaranth in several South Carolina sites (Strand and Hamilton, 2000). This pathogen is a white rust or water mold. Lesions developed on the leaves during flowering, starting in July; leaves later fell off (U.S. Fish and Wildlife Service, 2002c). Effects on infected individuals were significant, resulting in death of the plants 2-4 weeks after lesions were first observed. Anecdotal observations suggest that isolated plants tended to avoid infection (Strand and Hamilton, 2000).

c. Rangewide Trends

Based on limited data from previous years, 1988 was a highly productive year for seabeach amaranth, and 1989 also began with favorable conditions for the species. Several coastal storms later in 1989 and 1990 caused severe erosion in the Carolinas. Subsequent dune reconstruction and bulldozing caused further damage in some areas (Weakley and Bucher, 1992). These storms may have also been responsible for the transport of seabeach amaranth to New York (U.S. Fish and Wildlife Service, 1993). Due to storm effects (erosion, reconstruction activities, and a curtailed reproductive season due to flooding and overwash), an approximate 75 percent decrease in population numbers occurred in 1990, even with new sites established in New York (see Table 7). Results from 1991 should be discounted because survey efforts were low in the Carolinas. Total population numbers rebounded in 1992, decreased in 1993, then leveled off at approximately 10,000 plants from 1994 through 1997. This population size is only about 23 percent of the 1988 peak, but is only slightly lower than 1987, which was considered a reasonably productive year (Weakley and Bucher, 1992). 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. Despite documented storm losses in North Carolina in 1998 and 1999, a large range-wide population increase occurred in the 3-year period from 1998 to 2000. The 2000 population was more than 300 percent above the earlier 1988 peak. Somewhat increased survey efforts for the period 1998-2000 do not account for the sizeable population increase relative to previous years.

Total population trends can disguise important regional trends. Recent population increases have occurred entirely in the northern part of the species range (see Table 7). Seabeach amaranth has undergone a geographic expansion, reappearing in five States over 11 years, after decades of extirpation from the entire northern portion of its range. New York sites account for virtually all of the recent increases in total population size rangewide, offsetting low numbers in the south. Although natural population variability and survey effort must be considered, the recent trend in North Carolina is clearly downward. The low 1999 and 2000 plant totals in that State are especially noteworthy given the relatively high survey effort in these years (approximately 75 percent of known sites visited). The 1999-2000 average of 560 total plants is only about 1 percent of the 1988 peak for North Carolina, and only about 3 percent of the 1987-1998 State-wide average (excluding 1989 and 1991 because of insufficient data). The current status of seabeach amaranth in South Carolina is virtually unknown. The species experienced a 90 percent reduction in that State following 1988 storms, including Hurricane Hugo. However, spotty survey efforts in 1998 suggest that populations may have recovered in some areas of South Carolina.

The number of known, extant sites increased from 1987 to 1988 under favorable conditions in the Carolinas. Despite storm losses, the number of extant sites reached a peak of 52 in 1990, due to the species appearance in New York and a high level of survey effort in the Carolinas. The number of sites dropped off in 1992 and remained in the 20s through 1997, probably due to minimal survey effort in South Carolina. Numbers of sites rose in 1998 and 2000 because of a slightly higher survey effort in South Carolina, and expansion of the species into three new States.

Historically, seabeach amaranth was known from 31 counties in 9 States (U.S. Fish and Wildlife Service, 1993). Weakley and Bucher (1992) show 27 counties in the species historic range. Of these, 14 counties in 3 States had extant populations based upon 1987-1990 surveys. Based upon 1998-2001 surveys, at least 19 counties in 7 States have extant populations of seabeach amaranth.

Despite 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 650 km (404 miles) to the north, but contracted about 50 km (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.

Despite the geographic expansion and booming New York populations, seabeach amaranth is still vulnerable to local and regional extinction. The primary threat to seabeach amaranth, altered habitat, has not significantly diminished since the species was listed, and new threats have been subsequently discovered. Small population sizes in many locations increase the risk that seabeach amaranth will become locally extirpated. Almost 44 percent of sites documented in 2000 contained fewer than 10 plants, including more than 60 percent of sites in North Carolina (Young, 2001; McAvoy, 2000; National Park Service 2001a; 2001b; Jolls and Sellars, 2000; U.S. Army Corps of Engineers, 2001b; Hamilton, 2000a; U.S. Fish and Wildlife Service, 2002c). The uneven distribution of numbers of plants across the current known range leaves seabeach amaranth vulnerable to catastrophic events (*i.e.*, storms, oil spills, disease). In addition, the shift of the species numerical stronghold from south to north places great importance on its continued survival on northern beaches, which are more stabilized and developed, and experience more intensive recreational use, than southern beaches.

One final trend of note is the propagation of seabeach amaranth in greenhouses and laboratories, and the transplanting of propagated individuals or seed back into the wild. Such programs have been undertaken in Delaware, Maryland, North Carolina, and South Carolina (McAvoy, 2000; National Park Service and Maryland Natural Heritage Program, 2000; Jolls and Sellars, 2000; and Hamilton, 2000b).

V. ENVIRONMENTAL BASELINE

A. STATUS OF THE SPECIES WITHIN THE ACTION AREA

1. Piping Plover

A summary of piping plover nesting activity and productivity within New Jersey over the last 5 years is provided in Table 8 (Jenkins and Pover, 2001a, 2003; Jenkins *et al.*, 2004, 2005). Table 8 also provides summaries of New Jersey plover nesting activity both within and outside of the Corps Philadelphia District Program Area. Nearly two-thirds (25 out of 39) of the New Jersey piping plover nesting locations occupied over the last 5 nesting seasons are within the boundaries of the Program Area. In 2005, nearly 70 percent of known breeding pairs in New Jersey nested within the Program Area.

In addition to the areas occupied by plovers during the past 5 years, several additional sites within the Program Area exhibit habitat characteristics of suitable plover nesting habitat, such as the Two Mile Beach Unit of the Cape May National Wildlife Refuge and the oceanfront beaches within the Borough of Stone Harbor. It is reasonably certain that that these and other future sites where suitable habitat forms will become occupied by nesting piping plovers over the life of the Corps Program.

Overall, productivity on piping plover nesting beaches within the Corps Program Area has been well below the Atlantic coast population recovery goal (1.50 fledged chicks per pair), averaging only 0.82 chicks fledged per nesting pair over the last five nesting seasons (see Table 8). The number of nesting pairs within the Program Area in the past 5 years has ranged from a high of 94 pairs in 2003 to a low of 77 pairs in 2005; productivity during this 5-year period has declined substantially from a high of 1.18 chicks fledged per pair in 2001 to only 0.57 chicks fledged per pair in 2005. Average productivity within the program area has been consistently below the productivity level of 1.24 chicks per pair needed to maintain a stable population over the last 5 years.

2. Seabeach Amaranth

In 2000, seabeach amaranth was documented in Monmouth County after being absent from New Jersey since 1913. Table 9 summarizes the results of surveys conducted since 2000 for seabeach amaranth by Service, Corps, NJDEP, and NPS biologists in New Jersey; 2005 seabeach amaranth information was not yet available (U.S. Fish and Wildlife Service, 2004b). By 2003, the species range had expanded along the New Jersey Atlantic coastline and the plant now occurs in every New Jersey Atlantic coastal county. As shown in Table 9, these seabeach amaranth occurrences vary widely in size, ranging from a single plant to more than 9,000 plants. Plant numbers at an individual site can also vary widely from year to year depending on site conditions, site management, and growing conditions.

Table 8. New Jersey Piping Plover Nesting and Productivity Summary, 2001-2005

Location	Year	Number of Breeding Pairs	Number of Nests Hatched	Number of Chicks Fledged	Number of Chicks Fledged/Pair (Productivity)
Sandy Hook Coast Guard	2001	6	6	11	1.80
	2002	7	7	8	1.14
	2003	8	6	13	1.63
	2004	7	1	4	0.57
	2005	3	2	6	2.00
Sandy Hook North Beach	2001	11	10	20	1.82
	2002	9	9	17	1.89
	2003	9	4	11	1.22
	2004	10	4	5	0.50
	2005	6	3	5	0.83
Sandy Hook North and South Gunnison	2001	3	2	3	1.00
	2002	5	5	11	2.20
	2003	6	2	0	0.00
	2004	4	0	0	0.00
	2005	2	1	0	0.00
Sandy Hook Critical Zone	2001	1	1	1	1.00
	2002	2	2	3	1.50
	2003	4	1	2	0.50
	2004	3	2	2	0.67
	2005	3	2	3	1.00
Sandy Hook Hidden Beach	2001	3	2	6	2.00
	2002	5	5	10	2.00
	2003	4	2	3	0.75
	2004	3	1	3	1.00
	2005	3	2	3	1.00
Sandy Hook Fee and South Fee Beaches	2001	7	5	8	1.14
	2002	7	7	11	1.57
	2003	7	3	7	1.00
	2004	5	3	7	1.40
	2005	5	4	8	1.60
Sea Bright North	2001	3	1	4	1.30
	2002	5	4	10	2.00
	2003	7	4	3	0.43
	2004	5	4	7	1.40
	2005	7	5	9	1.29
Monmouth Beach	2001	5	4	6	1.20
	2002	4	3	6	1.50
	2003	2	2	5	2.50
	2004	4	2	4	1.00
	2005	3	2	5	1.67
Seven Presidents Park	2001	-	-	-	-
	2002	-	-	-	-
	2003	1	1	2	2.00
	2004	1	0	0	0.00
	2005	1	1	3	3.00
Long Branch	2001	-	-	-	-
	2002	-	-	-	-
	2003	1	1	1	1.00
	2004	-	-	-	-
	2005	-	-	-	-
Sea Girt and Wreck Pond	2001	-	-	-	-
	2002	1	0	0	0.00
	2003	1	1	1	1.00
	2004	1	1	2	2.00
	2005	1	0	0	0.00
Subtotal - Sites Outside Corps Philadelphia District Program Area	**2001**	**39**	**31**	**59**	**1.51**
	2002	**45**	**42**	**76**	**1.69**
	2003	**50**	**27**	**48**	**0.96**
	2004	**43**	**18**	**34**	**0.79**
	2005	**34**	**22**	**42**	**1.23**
	5-year average	**42.2**	**28.0**	**51.8**	**1.23**

Location	Year	Number of Breeding Pairs	Number of Nests Hatched	Number of Chicks Fledged	Number of Chicks Fledged/Pair (Productivity)
Island Beach State Park - Inlet	2001	-	-	-	-
	2002	-	-	-	-
	2003	2	1	1	0.50
	2004	3	1	2	0.67
	2005	2	0	0	0.00
Barnegat Light	2001	2	1	4	2.00
	2002	3	2	6	2.00
	2003	3	2	4	1.33
	2004	3	3	2	0.67
	2005	4	1	1	0.25
Holgate	2001	19	11	18	0.95
	2002	14	11	15	1.07
	2003	13	10	17	1.31
	2004	16	8	8	0.50
	2005	13	10	11	0.85
Little Beach	2001	12	7	11	0.91
	2002	17	14	13	0.76
	2003	19	12	22	1.16
	2004	19	7	4	0.21
	2005	11	4	2	0.18
North Brigantine	2001	12	11	26	1.17
	2002	15	9	17	1.13
	2003	17	4	6	0.35
	2004	8	5	7	0.88
	2005	8	5	10	1.25
Brigantine Inlet	2001	-	-	-	-
	2002	1	1	1	1.00
	2003	-	-	-	-
	2004	-	-	-	-
	2005	-	-	-	-
Ocean City – North / Seaview Harbor Marina	2001	8	4	10	1.25
	2002	8	4	5	0.63
	2003	2	1	2	1.00
	2004	1	1	1	1.00
	2005	1	1	1	1.00
Ocean City - Center	2001	9	9	7	0.78
	2002	8	5	1	0.13
	2003	8	7	8	1.00
	2004	8	4	0	0.00
	2005	5	3	5	1.00
Corson's Inlet State Park	2001	1	1	3	3.00
	2002	1	1	3	3.00
	2003	2	1	1	0.50
	2004	3	3	5	1.67
	2005	2	0	0	0.00
Strathmere Natural Area	2001	-	-	-	-
	2002	-	-	-	-
	2003	-	-	-	-
	2004	-	-	-	-
	2005	1	1	0	0.00
Strathmere Beach	2001	-	-	-	-
	2002	-	-	-	-
	2003	1	1	1	1.00
	2004	1	1	0	0.00
	2005	1	1	0	0.00
Whale Beach	2001	-	-	-	-
	2002	1	0	0	0.00
	2003	-	-	-	-
	2004	-	-	-	-
	2005	-	-	-	-
Sea Isle City	2001	1	0	0	0.00
	2002	-	-	-	-
	2003	-	-	-	-
	2004	-	-	-	-
	2005	-	-	-	-

Location	Year	Number of Breeding Pairs	Number of Nests Hatched	Number of Chicks Fledged	Number of Chicks Fledged/Pair (Productivity)
Townsend's Inlet	2001	1	1	0	0.00
	2002	1	1	2	2.00
	2003	1	1	2	2.00
	2004	1	1	2	2.00
	2005	1	1	0	0.00
Avalon- North	2001	1	1	1	1.00
	2002	-	-	-	-
	2003	-	-	-	-
	2004	-	-	-	-
	2005	-	-	-	-
Avalon Dunes	2001	4	4	8	2.00
	2002	7	7	9	1.29
	2003	8	4	6	0.75
	2004	8	4	6	0.75
	2005	5	0	0	0.00
Stone Harbor Point	2001	5	2	1	0.20
	2002	6	5	1	0.16
	2003	6	3	3	0.50
	2004	9	4	1	0.44
	2005	10	7	6	0.60
Champagne Island	2001	-	-	-	-
	2002	-	-	-	-
	2003	-	-	-	-
	2004	1	0	0	0.00
	2005	1	0	0	0.00
North Wildwood	2001	-	-	-	-
	2002	3	3	4	1.33
	2003	3	2	4	1.33
	2004	4	3	2	0.50
	2005	3	3	0	0.00
Coast Guard - LSU	2001	1	1	2	2.00
	2002	2	2	3	1.50
	2003	2	2	1	0.50
	2004	1	0	0	0.00
	2005	1	0	0	0.00
Coast Guard-TRACEN	2001	2	2	4	2.00
	2002	3	3	3	1.00
	2003	4	2	3	0.75
	2004	1	1	1	1.00
	2005	3	3	0	0.00
Cape May City	2001	2	2	2	1.00
	2002	1	0	0	0.00
	2003	-	-	-	-
	2004	1	1	0	0.00
	2005	-	-	-	-
Cape May Meadows	2001	3	2	1	0.33
	2002	2	2	2	1.00
	2003	3	3	4	1.33
	2004	4	3	7	1.75
	2005	5	5	8	1.60
Subtotal - Sites Within Corps Philadelphia District Program Area	**2001**	**83**	**59**	**98**	**1.18**
	2002	**93**	**70**	**85**	**0.91**
	2003	**94**	**56**	**85**	**0.90**
	2004	**92**	**50**	**48**	**0.52**
	2005	**77**	**45**	**44**	**0.57**
	5-year average	**87.8**	**56.0**	**72.0**	**0.82**
New Jersey Statewide Total	**2001**	**122**	**90**	**157**	**1.40**
	2002	**138**	**112**	**161**	**1.38**
	2003	**144**	**83**	**133**	**0.92**
	2004	**135**	**68**	**82**	**0.61**
	2005	**111**	**67**	**86**	**0.77**
	5-year average	**130.0**	**84.0**	**123.8**	**0.95**

Table 9. Summary of Seabeach Amaranth Sites in New Jersey, 2000 - 2004

Site Name	Number of Plants 2000	2001	2002	2003	2004	Average Since Discovery
Sandy Hook Coast Guard	0	1	5	1	0	2
Sandy Hook North Beach	0	0	2	0	2	1
Sandy Hook North Gunnison	6	0	11	2	0	4
Sandy Hook South Gunnison	1	5	15	2	2	5
Sandy Hook North of F Lot	8	25	12	0	8	11
Sandy Hook Lot E	0	0	0	0	1	1
Sandy Hook Lot D	0	0	0	0	181	181
Sandy Hook Critical Zone	7	53	98	45	872	215
Sandy Hook Hidden Beach	57	285	536	139	104	224
Sandy Hook Fee Beach	41	192	225	128	77	133
Sandy Hook South Fee Beach	0	0	0	225	420	323
Sandy Hook Subtotal	120	561	904	542	1,667	759
Sea Bright North	823	4,701	9,115	4,215	3802	4,531
Monmouth Beach North	81	109	24	48	355	123
Monmouth Beach South	15	373	762	130	882	432
Sea Bright/Monmouth Subtotal	919	5,183	9,901	4,393	5,039	5,087
Long Branch	-	2	0	2	0	1
Bradley Beach	-	1	0	1	0	1
Avon-by-the-Sea	-	0	4	0	0	1
Belmar - South of Shark River Inlet	-	2	59	0	0	15
Wreck Pond	-	0	0	1	22	12
Sea Girt - Municipal	-	17	10	1	0	7
Sea Girt - National Guard	-	1	18	6	9	9
Manasquan	-	0	1	0	1	1
Southern Monmouth Subtotal	-	23	92	11	32	40
Monmouth County / New York Corps District Subtotal	1,039	5,767	10,897	4,946	6,738	5,877
Bayhead	-	0	1	1	0	1
Mantoloking	-	2	0	1	0	1
Seaside Heights					1	1
Island Beach State Park Northern Natural Area	-	3	1	11	8	6
Island Beach State Park Central Recreational Area	-	0	0	5	0	3
Island Beach State Park Southern Natural Area	-	4	0	9	3	4
Island Beach State Park Subtotal	-	7	1	25	11	11
Long Beach Township	-	0	2	0	0	1
Edwin B. Forsythe National Wildlife Refuge - Holgate	-	1	4	2	2	2
Ocean County Subtotal	-	10	8	29	14	15
Edwin B. Forsythe National Wildlife Refuge - Little Beach	-	1	0	-	-	NA
Edwin B. Forsythe National Wildlife Refuge Subtotal	-	2	4	2	2	3
North Brigantine Natural Area	-	0	0	3	1	2
Brigantine - Municipal	-	34	1	5	0	10
Atlantic County Subtotal	-	35	1	8	1	11
Ocean City	-	0	0	1	5	3
Upper Township - Strathmere	-	1	2	98	46	37
Sea Isle City	-	0	0	0	5	5
Avalon	-	0	0	1	0	1
Coast Guard LORAN Support Unit	-	0	0	1	6	4
Cape May Point State Park	-	0	0	1	0	1
Cape May County Subtotal	-	1	2	102	62	42
Philadelphia District Subtotal	-	46	11	139	77	68
New Jersey Total	**1,039**	**5,813**	**10,908**	**5,085**	**6,815**	**5,932**

Of the known seabeach amaranth sites in New Jersey, 17 sites are found within the Program Area. While these sites currently support only a small portion (approximately 1 percent) of the known State amaranth population, given the high fecundity of the species (thousands of seeds for a large plant) (Jolls and Sellars, 2000) and the available dispersal mechanisms of wind and wave action along the New Jersey coastline, it is reasonably certain to expect that additional areas of suitable habitat will be occupied by the species over the life of the Corps Program and that some populations occurring in areas with favorable habitat conditions will expand over present plant numbers.

B. FACTORS AFFECTING SPECIES ENVIRONMENT WITHIN THE ACTION AREA

1. Habitat

Past stabilization projects along the New Jersey Atlantic coastline have fundamentally altered the naturally dynamic coastal processes that create and maintain beach strand habitats. Hard shoreline stabilization structures such as jetties and groin fields interrupt littoral drift, while bulkheads, boardwalks, and artificially created dunes prevent overwash. These structures prevent natural shoreline migration. Such stabilization has encouraged residential and commercial development and associated infrastructure along otherwise ephemeral and/or flood prone habitats. This subsequent development has forestalled formation of highly productive piping plover and seabeach amaranth overwash habitats and eliminated connectivity of piping plover oceanfront and bayside nesting and foraging habitats.

Several factors make abandonment or removal of hard stabilization structures in the project area unlikely in the foreseeable future. Such structures provide flood and storm protection to extensively developed, largely urbanized upland areas, including private property and public infrastructure valued in the billions of dollars. The State of New Jersey has furnished financial and technical assistance for shoreline stabilization of shore towns for decades. The New Jersey Shore Protection Master Plan calls for the maintenance of existing functional hard structures throughout the State (New Jersey Department of Environmental Protection, 1981).

Stabilized beaches may be unsuitable in configuration (*e.g.*, steep slopes, narrow berms) to serve as seabeach amaranth or piping plover nesting habitat. Hard structures may, in some cases, accelerate erosion and result in eventual scarping and narrowed berms. To promote stabilization of dunes, past planting of dune vegetation in some areas has resulted in dense vegetation that precludes nesting by piping plovers or colonization by seabeach amaranth.

Table 10 shows areas within the Corps Program Area that remain in a relatively undeveloped or sparsely developed state and, if applicable, the federal beach nourishment project that encompasses the site. Some sparsely developed public areas, such as Island Beach State Park, were established to provide recreational opportunities and have undergone some minor periodic

shoreline stabilization (such as sand fencing, sand transfer to repair dune breaches, and vegetation planting) to protect roads and parking lots. Other sites, such as the accreted sand filet at Barnegat Light, were formed and are stabilized by hard structures, but have not resulted in an expansion of residential and commercial development onto the newly formed area. The listed sites (with the exception of Whale Beach) have no, or only minimal, commercial or residential development and/or associated infrastructure directly behind the primary dune line or have large expanses of accreted sand in front of or behind the primary dune line. These sites (with the exception of Whale Beach) represent areas where natural overwash and / or blowout of dunes could be allowed, without significant threat of damage to development and infrastructure, and where subsequent formation of ephemeral pools and fore or back dune sand flats could occur unabated, providing high quality habitat for piping plovers and / or seabeach amaranth. Whale Beach, on Ludlam Island, is sparsely developed with only a few residential buildings and a road connecting the towns of Strathmere and Sea Isle City. The island is narrow at this point and is one of the few remaining sites along the New Jersey coast where overwash from oceanside to bayside would likely occur on a regular basis if natural coastal processes were not precluded by beach nourishment and dune construction.

Table 10. Undeveloped or Sparsely Developed Coastal and Barrier Island Areas within the Corps Philadelphia District Program Area in New Jersey

Project Name	Site(s)	County
New Jersey Shore Protection Study - Manasquan Inlet to Barnegat Inlet	Island Beach State Park	Ocean
New Jersey Shore Protection Study - Barnegat Inlet to Little Egg Inlet	Barnegat Light	Ocean
	Holgate	
N/A	Little Beach Island	Atlantic
Brigantine Inlet to Great Egg Harbor Inlet	North Brigantine Natural Area	Atlantic
	Brigantine Island – South End	
Great Egg Harbor and Peck Beach	North Ocean City	Cape May
	Corson's Inlet State Park	
Great Egg Harbor to Townsends Inlet	Corson's Inlet State Park	Cape May
	Strathmere Natural Area	
	Whale Beach	
Townsend's Inlet to Cape May Inlet	Avalon Dunes	Cape May
	Stone Harbor Point	
	Two Mile Beach	
Cape May Inlet to Lower Township	U.S. Coast Guard Training Center	Cape May
Lower Cape May Meadows to Cape May Point	Cape May Meadows Migratory Bird Refuge	Cape May
	Cape May Point State Park	

Additional accreting sandy areas often form along oceanfront inlets such as at the south end of Sea Isle City at Townsends Inlet or at North Wildwood along Hereford Inlet. These ocean inlet areas typically undergo periodic cycles of accretion and erosion and can be expected to support both piping plovers and seabeach amaranth when suitable habitat is present. These areas are often ephemeral and may not persist for more than a few years.

Of all undeveloped beaches within the Program Area, only Little Beach Island, owned and managed by the Edwin B. Forsythe National Wildlife Refuge is located entirely outside the boundaries of a federal shoreline protection project. Although the remaining sites are encompassed within federal project boundaries, not all of the sites will receive fill or be otherwise stabilized. No beach nourishment or dune stabilization is planned for Island Beach State Park, Barnegat Light, Holgate, Brigantine Island – South End, North Ocean City, Avalon Dunes, or Two Mile Beach. At North Brigantine Natural Area, Corson's Inlet State Park, and Strathmere Natural Area, planned nourishment activities include only tapers from adjacent nourished areas into these areas as described within the individual project descriptions provided above. Corps shoreline protection projects include past and future renourishment activities at Stone Harbor Point, Whale Beach, U.S. Coast Guard Training Center, Cape May Meadows Migratory Bird Refuge, and Cape May Point State Park.

At both Cape May Meadows and Stone Harbor Point, Corps project plans include a habitat restoration /enhancement component for piping plovers as further described above within the individual project descriptions. Constructing these restoration / enhancement projects, if successful, will serve to offset losses of or temporary impacts to piping plover habitat elsewhere within the Program area by providing high quality habitat in areas less subject to human disturbance than on recreational beaches. To derive maximum benefit, the restoration / enhancement projects should be constructed during the next scheduled nourishment cycle for the individual project areas.

In addition to the aforementioned nourishment projects, the Corps has completed two recent shoreline stabilization projects involving construction and repair of hard stabilization structures for which the Service completed formal consultation. In 1986, the Corps entered into formal consultation with the Service to address adverse effects to the piping plover as a result of construction of a jetty along the southern shore of Barnegat Inlet (South Jetty). The Service (1986) provided a Biological Opinion to the Corps with several conservation recommendations including use of Tern Island and the southern tip of Island Beach State Park as alternative nesting sites for piping plovers and least terns during construction; provide nesting habitat and eliminate human disturbance; use dredging spoils to create new nesting habitat for plovers and terns near the new South Jetty; and restrict public access to these newly created nesting sites. In addition, the Corps had committed to ensuring the habitat on the south side of Barnegat Inlet would remain suitable for piping plovers and increase plover use by creating an open-water area and removing dense vegetation. However, currently dense vegetation exists on the south side of Barnegat Inlet, reducing the amount of suitable nesting habitat available for piping plovers. The Corps has been advised by the Service that it is not in compliance with the 1986 consultation and must initiate actions to restore and enhance habitat on the south side of Barnegat Inlet. The

Service notes that the Corps has made attempts on more than one occasion to remove the dense vegetation; however, the Corps efforts have been limited due to New Jersey Land Use Regulation Program rules prohibiting vegetation removal. Efforts between the Corps and the Service are on-going to improve piping plover habitat on the south side of Barnegat Inlet.

In 2003, the Service completed formal consultation regarding the Corps repairs to existing structures on the northern shore of Barnegat Inlet within Island Beach State Park (North Shore Erosion Protection and Rehabilitation Project). The project included replacing an existing dilapidated wooden bulkhead with a stone revetment and extending protection to existing geotubes at Sedge Island. As conservation measures, the Corps committed to avoiding construction during the nesting season or, if avoidance was not feasible, to sequencing the project to avoid construction in proximity to plover nesting areas and within a protective buffer zone during the nesting season. Additionally, the local project sponsor, NJDEP, agreed to seek alternatives to linear fencing for protection of infrastructure and creation of dunes within the Southern Natural Area at Island Beach Sate Park (U.S. Fish and Wildlife Service, 2003b).

2. Beach Management and Recreational Use

The majority of beaches subject to shore protection activities within the Corps Program Area are managed and maintained by the local municipalities. For municipal beaches with extant occurrences of piping plover and / or seabeach amaranth, the Corps, the Service, and the NJDEP have been working cooperatively with municipal officials and beach managers to minimize impacts to listed species from municipal management and maintenance activities and from recreational beach users. Through an agreement pursuant to Section 6 of the ESA, the NJDEP, ENSP has taken a lead role in monitoring and managing some federally listed wildlife species, including the piping plover. The Service provides limited funding assistance to supplement ENSP's piping plover monitoring, threat assessment, and management activities in New Jersey. The ENSP's efforts focus primarily on ensuring protection of piping plovers nesting on State and municipal beaches. Nourishment of municipal beaches has increasingly created habitat for piping plovers and has drawn nesting birds to areas subjected to higher levels of human use. As the number of occupied nourished municipal beaches increased, the need for management of plover sites and abatement of threats to nesting birds and their young has outpaced the staffing capabilities of the ENSP or the Service.

To reduce the recreational user impacts on Corps nourished beaches, the Corps has provided funding and/or required the State and local project sponsors to provide funding to the ENSP to hire additional staff to monitor and manage piping plovers nesting on Corps nourished beaches. A report summarizing site-specific piping plover management needs and actions undertaken to protect the species is prepared annually by the ENSP. A copy of the ENSP's 2003 annual report is provided in Appendix C and serves as a summary of site specific beach management and recreational use issues on nourished beaches within the Corps Program Area. Annual updates of the report will be available at the NJDEP web site (http://www.njfishandwildlife.com/ensphome.htm).

While the Corps has provided funding to identify sites within its Program Area with occurrences of seabeach amaranth, to date little to no site-specific management for seabeach amaranth is occurring on nourished beaches within the Program Area. Management of federally and State-listed plants in New Jersey rests, not with the ENSP, but with the NJDEP, Office of Natural Lands Management (ONLM). The ONLM does not have sufficient staff to provide assistance to municipalities in implementing site-specific management activities for seabeach amaranth.

To ensure the protection of federally listed species within the Corps Program Area, the Corps has begun requiring that municipalities receiving beach nourishment prepare a municipal beach management plan. To date, the municipalities of Avalon, Stone Harbor, Ocean City, and Upper Township (Strathmere) have completed draft plans in coordination with the ENSP. However, the plans have not been in full compliance with the Service's (1994) *Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitats on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act*. Coordination to resolve outstanding issues is ongoing. The ENSP has indicated its intent to pursue development of either State-wide or individual Habitat Conservation Plans, pursuant to Section 10 of the ESA, that may allow for exceptions to Service Guidelines, provided additional compensatory conservation measures are undertaken by the towns to minimize incidental take of piping plovers on municipal beaches.

State-owned lands within the Corps Program Area, such as Island Beach and Corson's Inlet State Parks and the North Brigantine and Strathmere Natural Areas, are managed by the NJDEP, Division of Parks and Forestry. Federally-owned lands such as Edwin B. Forsythe and Cape May National Wildlife Refuges are managed by the Service's Division of Refuges; USCG lands such as Two Mile Beach or the USCG Training Center are managed by the USCG with assistance from the Service and the ENSP. The Cape May Migratory Bird Refuge is privately owned and managed by The Nature Conservancy.

Beach management activities occurring on Corps nourished or stabilized sites with federally listed species within the Corps Program Area include dune construction and maintenance, vegetation planting and maintenance, sand fencing, beach raking, sand harvest, trash collection, and off-road vehicle use by lifeguards, police, and maintenance staffs. Recreational uses occurring on Corps nourished or stabilized sites with federally listed species within the Corps Program Area include sunbathing, walking, jogging, boating, volleyball, kite-flying, dog-walking, fireworks displays, surf-fishing, and recreation vehicle use.

3. Predation

Predation has been identified or is strongly suspected as a significant factor reducing piping plover productivity at some project area nesting areas. To reduce nest losses from predation, the ENSP erects predator exclosures around nests where circumstances warrant. While predator exclosures are effective in reducing nest losses, they do not offer protection to chicks. The precocial chicks leave the nest site within hours of hatching, becoming vulnerable to a variety of predators. Predators encountered within the Program Area include foxes, raccoons, gulls, crows, ghost crabs, and feral or free-ranging domestic dogs and cats. Most municipalities and publicly owned lands have ordinances prohibiting pets on the beach. However, leashed and unleashed

dogs are commonly encountered during the nesting season and can present a greater threat than pedestrians (Jenkins and Pover, 2001b). Predation by feral and free-ranging cats is of concern at a number of plover nesting sites within the Program Area, including the Townsends Inlet, Avalon North, Avalon Dunes, Stone Harbor Point, and Cape May City nesting sites (Jenkins and Pover, 2002). Increased enforcement of pet prohibition ordinances and other measures to reduce predation by feral cats are needed throughout the Corps Program Area.

Predation of newly hatched piping plover chicks by ghost crabs has been documented by The Nature Conservancy staff at Cape May Meadows Migratory Bird Refuge (Frie, pers. comm., 2003). Ghost crab numbers, as well as the size of individuals, appear to be increasing at the Cape May Meadows nesting site (Patt, pers. comm., 2002). Ghost crab predation also likely contributes to plover egg and/or chick loss at the Holgate Unit of Edwin B. Forsythe NWR and Avalon Dunes nesting sites (Turner, pers. comm., 2002; Jenkins and Pover, 2002).

4. Other Beach Nesting Birds

a. Least Tern

Piping plovers often nest in association with least tern (*Sterna antillarum*) colonies, presumably benefiting from the aggressive behaviors of terns in driving away predators (Burger, 1987). Total least tern numbers within colonies in New Jersey for the 5-year period of 1999 to 2003 and a summary of sites within and outside the Program Area are shown in Table 11 (Canale, 2000; New Jersey Endangered and Nongame Species Program, 2001; 2002; 2003; Pover, pers. comm., 2002; 2004). Least tern information for the 2004 and 2005 nesting seasons was not available.

Burger (1987) found that piping plovers in New Jersey derived anti-predator benefits from nesting near terns, and plovers nesting in tern colonies often had higher success than those nesting out of tern colonies. Seabeach amaranth also benefits from the presence of least tern colonies, since restrictions on public access in the nesting areas provide protected areas where plants can become established (Weakley and Bucher, 1992). Least terns are listed as endangered by the State of New Jersey.

b. Black Skimmer

The State-listed (endangered) black skimmer (*Rynchops niger*), also nests within the Program Area. Plovers often nest within or in close proximity to skimmer colonies. As with least terns, seabeach amaranth would benefit from the presence of black skimmer colonies since restrictions on public access during the nesting season provides protected areas where plants could become established. Total black skimmer numbers within colonies in New Jersey for the 5-year period of 1999 to 2003 are shown in Table 12 (New Jersey Endangered and Nongame Species Program, 2001; 2002; 2003). All black skimmer nesting sites in New Jersey during this 5-year period were located within the Corps Philadelphia District Program Area. Black skimmer information for the 2004 and 2005 nesting seasons was not available.

Table 11. Number of Adult Least Terns at New Jersey Nesting Sites: 1999-2003

SITE	1999	2000	2001	2002	2003
Newark Airport			40		
Sandy Hook:					
Coast Guard	26	20	36	77	95
Critical Zone					75
Gunnison	24	22	14	17	53
North Beach	118	46	51	23	74
Hidden Beach	8	35	109	145	71
Fee Beach	82	195	178	182	110
South Fee Beach					9
Sea Bright - North	87	33	38	74	104
Monmouth Beach - North	842	233			281
Monmouth Beach - South	26	82	12	8	
Seven Presidents Park				70	86
Long Branch					128
Belmar - Shark River Inlet		9	57	151	48
Sea Girt - Wreck Pond			24	21	191
Sea Girt - NGTC		15	197	48	26
Subtotal – Sites Outside Philadelphia Program Area	***1213***	***690***	***756***	***816***	***1351***
Gull Island		67			
Island Beach State Park - Dike					17
Barnegat Light	25			34	6
Holgate		100		70	60
North Brigantine Natural Area	6	4	28	23	
Longport- Seaview Harbor Marina				16	
Ocean City - North	195	379	354	215	12
Ocean City - Center	191	67	15	12	19
Corson's Inlet St. Park				7	
Townsends Inlet		42	57	90	36
Avalon - North		5	5		
Avalon - Dunes	158	135	142	293	213
Champ Island				5	
Stone Harbor Point	98	90	37	57	255
N. Wildwood- Hereford In.				105	490
USCG - LSU		4	84	152	41
USCG - TRACEN	50				
Cape May City – Poverty Beach					66
Cape May Meadows - TNC	30	132	16	38	34
Cape May Point State Park					10
Magnesite Plant			16	5	
Subtotal –Sites within Philadelphia District Program Area	***753***	***1025***	***754***	***1122***	***1259***
Total Number of Birds	**1966**	**1715**	**1510**	**1938**	**2610**
Number of Colonies	**16**	**21**	**21**	**26**	**27**

Table 12. Number of Black Skimmers at New Jersey Nesting Sites: 1999-2003.

SITE	1999	2000	2001	2002	2003
Sedge	2				
East Point Island				2	6
Pettit	2	2	2		
North Clam		4	8		
Barrel Island				79	
Island Beach State Park – Dike					89
Mordecai Island					302
East Sedge Island	34				75
Hester Island					
Holgate		250		130	425
Marshelder Island	150	125	180	86	
Middle Sedge	2				
Tow Island	250	70	18	60	
Egg Island		56		12	
Ocean City – North		25	1212	496	
Strathmere Natural Area	1613	1459		562	463
Strathmere Bay Island			465	147	153
Stone Harbor Point	568	634	870	397	1337
Hereford Inlet (Champagne Island)		103		204	
Coast Guard EECEN				11	
Total Number of Birds	**2621**	**2728**	**2755**	**2186**	**2850**
Number of Active Colonies	**8**	**10**	**7**	**12**	**8**

VI. EFFECTS OF THE ACTION

In evaluating the effects of the federal action under consideration in this consultation, 50 CFR 402.2 and 402.14(g)(3) require the Service to evaluate both the direct and indirect effects of the action on the species, together with the effects of other activities that are interrelated or interdependent with the action that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for project justification. Interdependent actions are those that have no independent utility apart from the action under consideration. The Corps Program will have some beneficial effects at piping plover and seabeach amaranth areas prone to erosion and at the Cape May Meadows and Stone Harbor Point habitat restoration areas. However, the Corps Program will also cause direct and indirect adverse effects on piping plovers and seabeach amaranth, as discussed below.

The life of individual projects encompassed with the Corps Program varies and projects are in various stages of completion. However, most Program activities involve long-term maintenance of hard shoreline stabilization structures and long-term periodic beach renourishment. Therefore, for the purpose of evaluating the effects of the action, the Service considered the effects of the action over a maximum 50-year Program life.

A. BENEFICIAL EFFECTS

1. Habitat Creation Incidental to Beach Nourishment

Prior to beach nourishment, many sites within the Program Area now occupied by piping plovers and seabeach amaranth had become unsuitable due to previous shoreline stabilization efforts. Sandy beach habitats had eroded and new habitats were precluded from forming by the extensive system of hard stabilization structures and upland development found along the New Jersey coast. Nourishment of oceanfront beaches can create nesting habitat for piping plovers and suitable sites for seabeach amaranth. For example, in the late 1980s and early 1990s, areas such as the island of Peck Beach were narrow with little suitable piping plover nesting habitat in the urbanized Ocean City portion of the island, where up to 12 blocks of densely developed residential and commercial structures span the island from ocean to bay along approximately 7 miles of coastline. No natural formation of suitable sandy beach habitat was likely due to the presence of manmade structures (*i.e.*, boardwalks, roads, residential and commercial buildings). During that period, plovers were not known to nest on Ocean City's recreational beaches, while as many as 10 pairs nested on the southern "natural" end of the island at Corson's Inlet State Park.

Within a few years of the 1991 nourishment of Peck Beach, suitable habitat formed in front of Ocean City's developed areas and piping plovers began nesting, although frequently in conflict with recreational activities such as sunbathing and fireworks displays. Over the last 5 years (2001-2005), an average of 8 piping plover pairs per year have nested within Ocean City's nourished beaches in the center of the island (see below for discussion of adverse effects of

recreational use on nourished beaches), while an additional average of 4 pairs have nested on beaches at the northern end of town. During this same period, the number of pairs nesting at Corson's Inlet State Park, at the south end of Peck Beach, an area not subject to beach nourishment, has declined to an average of only 2 pair per year. Further, in 2003 a single seabeach amaranth plant was found at Ocean City on an area periodically receiving sand nourishment; 5 seabeach amaranth plants were found in 2004. Seabeach amaranth had not been found within Ocean City since 1876, a period of 127 years (New Jersey Natural Heritage Program, 2003).

It can be anticipated that, following initial construction of the federal nourishment projects within the Program Area, similar creation of potentially suitable habitat for piping plovers and seabeach amaranth will occur in areas where these species are currently absent, or in the case of seabeach amaranth, are present in only very low numbers. It should be noted that although the Corps nourishment projects will create sandy beach habitat that may attract piping plovers, the habitat created can be expected to be of lesser quality than habitat that is formed through natural coastal processes such as overwash. Specifically, the federal nourishment projects pending initial construction include: Manasquan Inlet to Barnegat Inlet; Barnegat Inlet to Little Egg Inlet; Brigantine Inlet to Great Egg Harbor Inlet – Brigantine Island; Brigantine Inlet to Great Egg Harbor Inlet – Absecon Island; Great Egg Harbor to Townsends Inlet – Ludlum Island; Hereford Inlet to Cape May Inlet – Five Mile Beach; and Lower Cape May Meadows to Cape May Point. Subsequent renourishment events throughout the Program Area can be expected to benefit piping plovers and seabeach amaranth by maintaining sandy beach habitats over the life of each project.

In addition to creation of habitat within the individual nourishment project areas, sand transport can be anticipated to increase adjacent to the targeted sand placement areas. For example, following nourishment events at Ocean City, accretion of sand occurred at the north end of Peck Beach (north Ocean City) at the Great Egg Harbor Inlet creating suitable piping plover nesting and foraging habitat. This habitat was temporary, diminishing over time as the need for beach renourishment at Ocean City became greater. Following each nourishment event at Ocean City, sand transport is likely to increase and accretion of sand at downdrift locations will likely re-occur.

While the above federal nourishment projects have potential to create habitat for piping plovers and seabeach amaranth, habitat creation alone will not create a beneficial effect for either species if the habitat is suboptimal and does not provide foraging habitat for plover chicks or if disturbance from municipal and recreational users cannot be managed to avoid loss of nests or chicks or loss of plants. Adverse effects associated with federal nourishment projects are discussed further within the below Adverse Effects section of this Biological Opinion.

2. Habitat Restoration

Two federal projects include environmental restoration of coastal habitats as a project component: Townsends Inlet to Cape May Inlet - Stone Harbor Point, and Lower Cape May Meadows to Cape May Point. The Service completed individual formal consultation on the

Townsends Inlet to Cape May Inlet - Stone Harbor Point project in 2002 (U.S. Fish and Wildlife Service, 2002a) and consultation of the Lower Cape May Meadows to Cape May Point project in 2003 (U.S. Fish and Wildlife Service, 2003a). Both projects represent a proactive effort by the Corps to incorporate habitat features that will benefit nesting and foraging piping plovers into the project design.

While Stone Harbor Point is currently accreting through natural processes and possibly as a result of the 2002-2003 renourishment event at Seven Mile Island, much of the beach is low in elevation and prone to flooding. The restoration project proposed by the Corps will elevate the low-lying beach berm at Stone Harbor Point, creating 67 acres of piping plover nesting habitat. The Corps design mimics naturally occurring tidal spits interspersed with intertidal sluices that will expose sand and mud flats preferred by plovers as foraging habitat. Approximately 15 acres of bayside intertidal foraging habitat will be created by the Corps restoration project.

The Borough of Stone Harbor will continue to restrict recreational activities within the area during the nesting season. The Corps restoration project has potential to create a highly suitable nesting area with access to both oceanfront and bayside feeding areas, free from human disturbance. Other than during initial construction, no further nourishment events are planned for Stone Harbor Point. Instead, coastal processes will be allowed to reshape the area, providing potential overwash habitats preferred by piping plovers. If successful, the restoration project can be expected to increase productivity of piping plovers nesting at Stone Harbor Point.

The Lower Cape May Meadows beach restoration project proposed by the Corps will increase the amount of available piping plover nesting habitat and retain existing habitat features preferred by plovers, such as newly forming dunes, sand and shell back beach flats, and low lying back dune swales. Barring other interventions, beaches at Lower Cape May Meadows and throughout the project area would eventually become too narrow and scarped to support nesting piping plovers. Therefore, the initial beach nourishment may offset adverse effects to piping plovers by creating suitable (but not optimal) sandy beach habitat. The lower design elevation of the “forward” beach berm along the Cape May Migratory Bird Refuge beachfront will facilitate periodic overwash and encourage formation of alternate feeding habitat (*i.e.,* wet swales, storm-fed tidal pools) in areas free from human disturbance.

While the size and configuration of these restoration projects provides reason for considerable optimism for success, the Corps projects are experimental; therefore, the anticipated benefit cannot be quantified at this time. Nonetheless, the Service anticipates that these restoration projects will provide a foundation and a body of knowledge that may allow for incorporation of piping plover and seabeach amaranth habitat features into additional future renourishment events elsewhere within the Corps Program Area.

3. Monitoring and Management Program

To reduce the recreational user impacts on Corps nourished beaches, the Corps has provided funding and /or required the State and local project sponsors to provide funding to the ENSP to hire additional staff to monitor and manage piping plovers nesting within the Corps civil works

project areas. Monitoring and management activities are conducted on both the nourished and unnourished portions of a project area to offset adverse impacts to plovers and their habitat within areas receiving fill. For example, within the Great Egg Harbor and Peck Beach project area, the Corps-funded monitor surveys for and monitors piping plover nests and broods. The monitor also conducts management activities, such as installing symbolic fencing, and provides outreach and education to beach users within the nourished area as well as within areas that did not receive fill during the renourishment event (*e.g.*, northern Ocean City at Great Egg Harbor Inlet). Impacts to piping plover nests and broods at northern Ocean City from recreational users and unleashed dogs would be substantial without the management actions carried out by the Corps-funded monitor.

The Corps has committed to continuing this monitoring and management, and to expand the Program to include protection for seabeach amaranth, on all nourished beaches beginning with the initial fill event and continuing annually for the life of the project or until assumed by the State or local project sponsor. Additionally, to ensure the protection of federally listed species following project construction, the Corps will require each municipality or other appropriate landowner to prepare site-specific endangered species management plans. The management plans will include specific protective measures to be implemented in known piping plover and seabeach amaranth areas, such as restrictions on beach raking, beach maintenance, and recreational activities. These actions can be expected to benefit piping plovers and other beach nesting birds by reducing disturbance to nesting birds and to protect seabeach amaranth plants from destruction by pedestrians and vehicles.

4. Dune and Beach Guidelines

The Corps will work with the Service, the NJDEP, and the USDA to develop guidelines for planting and maintaining dune and beach vegetation and erecting sand fence on Corps nourished beaches that are protective of federally listed species. Following nourishment of beaches the local municipalities and / private landowners are responsible for maintenance of the dunes on nourished beaches. Over-stabilization of dunes through dense vegetation planting or sand fencing can destroy or preclude formation of suitable habitat for piping plovers and seabeach amaranth and can impede movement of piping plover chicks. Corps guidelines will have a beneficial effect by ensuring that vegetation plantings and sand fencing used are compatible with the habitat requirements of federally listed species and that suitable habitat conditions are maintained over the life of the project.

B. DIRECT ADVERSE EFFECTS

Corps Program activities occurring on or adjacent to sites currently occupied by federally listed species could have direct adverse effects. Beach nourishment generally involves operation of a pipeline to pump sand onto the targeted beach and subsequent contouring of the pumped sand by earth-moving equipment. Even in areas where sand placement will only occur seaward of the present high-tide line, significant disturbance of the upper beach from equipment and crews can be expected. Therefore, beach nourishment during the nesting / growing seasons would likely result in significant adverse effects to piping plovers and seabeach amaranth where they occur.

Repair, replacement and extension of the Townsends Inlet and Hereford Inlet Seawalls and other Corps maintenance and operations activities, if conducted during the nesting season, could result in disturbance to nesting piping plovers or their young. Operation of equipment and crews on beaches in support of these maintenance and operations activities could destroy or diminish habitat suitability or kill or injure plover adults, nests, or young or seabeach amaranth plants and seedlings. Conservation measures proposed by the Corps, if effectively implemented by the Corps, contractors, and skilled monitors, are expected to minimize direct disturbance of piping plovers and to offset losses of seabeach amaranth.

1. Disturbance of Piping Plovers

The Corps plans to complete its Program activities outside of the piping plover nesting season (March 15 to August 15) wherever possible, and any work during the nesting season will be conducted only outside of known nesting areas or where habitat is no longer suitable. However, due to the estimated length of construction timeframes for initial beach nourishment events and the seawall repair and replacement projects, work during the piping plover nesting season cannot be totally avoided.

For beach nourishment projects undertaken during the nesting season, hydraulic pipelines will be placed offshore in all areas with known plover nests. The Corps plans to have a qualified monitor present during all construction occurring during the nesting season. In general, known piping plover nesting areas will be afforded a 1,000-meter buffer during the nesting season to avoid disturbance to piping plover courtship, nesting, and brood rearing. If conditions allow, reduced buffers may be permitted and will be derived on a case-by-case basis through coordination by the Corps with the Service and the ENSP. Seawall construction and other maintenance and operations activities will be scheduled to avoid the piping plover nesting season where possible or will be sequenced so that activities adjacent to known nesting sites will be afforded a minimum 100-meter buffer. Project-related vehicles and equipment will not transit through known piping plover nesting areas during the nesting season.

The proposed protective measures and buffers proposed by the Corps, as described above, are sufficient to eliminate most direct disturbances to nesting piping plovers. However, while the vast majority of piping plover nesting activity generally occurs between March 15 and August 15 each year, some birds may arrive early and initiate nesting behavior before March 15 and a few chicks from late nests may not have fledged by August 15. Therefore, it is conceivable that, on occasion, the actual piping plover nesting season may extend beyond the typical March 15 to August 15 nesting season. Corps activities occurring in proximity to such nesting activities could result in disturbance to adults or young.

Piping plovers attempting to nest or rear broods in previously unoccupied areas may be subjected to disturbance if not detected immediately by the Corps monitor or ENSP staff. Additionally, the buffer distances around known plover nesting areas could prove to be inadequate and result in temporary disturbance until appropriate adjusted buffers are determined. If all proposed protective measures are strictly employed, a temporary disturbance event should persist for no more than several hours to a maximum of 1 day before being detected and remedied. The

Service anticipates that nesting piping plovers will be subjected to no more than one construction-related temporary disturbance event per newly detected nesting territory or known nesting site. After one disturbance event, the Corps' protective measures should function to enable field monitors and construction crews to respond by adjusting buffers and/or construction activities as needed to avoid a second disturbance. The Service anticipates that most instances of disturbance will not likely result in physical injury or death of adult birds. However, even a single temporary disturbance can result in disruption of courtship activities, preclusion of nest initiation, interference with foraging or roosting, abandonment of nests or chicks, or stress to adults and chicks that may result in chick mortality. The Service anticipates that any newly established territories, nests, or broods that are not detected by the monitor and that occur within an active construction site will be abandoned or destroyed.

The proposed 1,000-meter buffer around unfledged chick foraging areas is adequate and appropriate, provided a monitor is present on site during construction, as proposed by the Corps. This buffer size is also consistent with the Service's Guidelines for motorized vehicle use in nesting areas, which cites observations of chicks moving 400 to 1,000 meters after hatching (U.S. Fish and Wildlife Service, 1994), and one observation of a brood in Maryland moving more than 1,000 meters from its nest (Loegering, 1992). On Cape Cod, Jones (1997) observed 2 out of 101 broods more than 1,000 meters from nest sites on 5 occasions, with a record distance of 1,300 meters. In other seasons on outer Cape Cod, broods have been observed moving up to 1,600 meters from their nest and back in one day, and have moved maximum distances of 4,000 meters before fledging. At the North Brigantine Natural Area in Atlantic County, New Jersey, the ENSP observed 4 piping plover broods move distances of 1,545 meters, 563 meters, 547 meters, and 386 meters from their respective nest sites prior to fledging during the 2003 nesting season (Pover, pers. comm., 2004). Considering the severity of disturbance in sand placement areas, and maximum brood movements greater than 1,000 meters observed by Pover (pers. comm., 2004), Jones (1997), and Loegering (1992), the proposed 1,000-meter buffers for sand placement when chicks are present are only adequate to prevent injury or mortality of chicks when a monitor with the capability to adjust buffers as needed is available on-site during construction. If broods are not closely monitored, death or injury to chicks could result.

State and federal biologists have observed that most spring and fall migrant plover stopover activity on New Jersey beaches occurs in areas that are not subject to nourishment, such as near tidal pools and moist sandflats at the accreting ends of barrier islands, or in known nesting areas where spring migrants will be the beneficiaries of measures to protect breeding plovers. Potential disturbance to any spring migrants detected by monitors on beaches outside of known nesting areas will also be reduced due to the Corps provision for establishment of temporary buffers around sightings of adult piping plovers. Therefore, any impact from the Corps Program activities on spring migrant and non-nesting piping plovers is anticipated to be insignificant. While a small amount of potential habitat use by adults and fledged chicks from nearby New Jersey nesting areas or elsewhere along the Atlantic flyway may occur within Corps project areas during the end of the nesting season through the latter part of the fall migration, the impacts to staging post-breeding birds and migrants from disturbance of foraging or resting activities are anticipated to be small and would be outweighed by benefits of allowing nourishment activities

to proceed as soon as possible at the conclusion of the nesting season so that maximum prey recovery may occur prior to the next nesting season.

The Corps Program is complex and involves several different Corps Divisions and work groups as well as project co-sponsors and private contractors. While the Corps has proposed programmatic conservation measures designed to entirely avoid direct disturbances to nesting plovers from Program-related activities, occasional failure to detect nesting or foraging piping plovers, occasional lapses in implementation of conservation measures, or occasional breakdown in communication and coordination among Service, Corps, NJDEP, municipal, construction, and monitoring staff is likely to occur over the 50-year life of the Corps nourishment projects and for the duration of the Corps maintenance of existing hard shoreline structures. Such occasional failures, lapses, or breakdowns could result in unintentional death or injury to piping plover adults, eggs, or young during the life of the Program.

Consultation between the Service and the Corps on individual Corps projects encompassed within this programmatic consultation will continue to be required to ensure that each project is consistent with the Corps' programmatic conservation measures and to identify and address any unanticipated adverse impacts to federally listed species not included within this programmatic Biological Opinion. The Service anticipates that such future project-specific consultation will further minimize or avoid direct disturbance to piping plovers from Corps Program activities. The direct effects of the Corps Program activities are anticipated to result in loss of no more than 1 piping plover nest or brood per nesting season and no more than 1 piping plover adult over the 50-year life of the Corps Program.

2. Destruction of Seabeach Amaranth Plants and Seed

Within Corps project areas, a minimum 3-meter buffer will be delineated and symbolically fenced around known and newly detected seabeach amaranth plants during the growing season. Construction activities will be avoided within delineated amaranth areas to the greatest extent possible. However, if Program-related activities cannot be avoided within amaranth sites, the Corps will take action, as described within the Corps conservation measures, to restore a population of similar size to the affected site. Conservation actions to be taken will depend on the number of plants to be affected and the season of disturbance and will be determined following close coordination with the Service. Actions may include one or more of the following: transplanting amaranth plants to similar habitats near or within the project area; collecting seed for replanting of the affected area; or scraping, stockpiling, and re-spreading the top layer of sand from amaranth areas in an attempt to return seed to the affected area. Since the effectiveness of the proposed conservation measures cannot be assured, any affected seabeach amaranth plants / populations within the Program Area could be lost.

Impacts to the beach zone providing potentially suitable habitat for seabeach amaranth from Corps Program activities are expected to be significant. Any seeds dispersed into previously unoccupied areas from nearby populations would likely be buried if occurring within active project sites. Additionally, any undetected amaranth plants or seedlings would likely be buried

or crushed. Therefore, the Service expects up to 100 percent burial of the amaranth seedbank and loss of undetected plants occurring within active project sites.

Occasional lapses in implementation of conservation measures or occasional breakdown in communication and coordination among Service, Corps, NJDEP, municipal, construction, and monitoring staff is likely to occur over the 50-year life of the Corps nourishment projects. Such occasional lapses or communication breakdowns could result in unintentional death or injury to seabeach amaranth plants during the life of the Program.

Since seabeach amaranth is an annual plant, numbers of seabeach amaranth plants within a site can fluctuate greatly from year to year. Therefore, the number of plants / populations potentially impacted over the life of the Corps Program cannot be determined. Seabeach amaranth has been known to colonize nourished beaches and natural forces affecting the spread of amaranth are anticipated to remain the same over the life of the Program. Therefore, the impact to the species from Program activities is anticipated to be in the form of a temporary reduction in Program Area plant numbers and / or a delay in colonization of previously unoccupied sites.

C. INDIRECT ADVERSE EFFECTS

1. Preclusion of Natural Habitat Formation

As discussed above within the Species Status, stabilized beach strands are generally less productive habitats for piping plovers and seabeach amaranth than more dynamic, unstabilized beaches, particularly inlets and overwash areas. The Corps Program will adversely affect piping plovers and seabeach amaranth by contributing to the perpetuation of the highly stabilized New Jersey coastline. The subject beach nourishment affords protection to existing seawalls, bulkheads, and upland development by buffering these structures from storm tides and wave attack. The Program perpetuates a system of shoreline stabilization structures that has essentially stopped the natural process of shoreline retreat and, consequently, prevents the natural formation of optimal habitats for piping plovers and seabeach amaranth (*e.g.*, inlets and overwash areas).

The adverse effects of a stabilized shoreline within the Corps Program Area on numbers of individuals of piping plovers and seabeach amaranth plants are difficult to quantify since such a quantification would depend on where, when, and how new habitats would form if stabilization efforts were halted, and to what degree these habitats would permit expansion of current populations. Given the past history of coastal stabilization and intense coastal development that has previously occurred within the Program Area, it is also not possible to quantify the amount of "naturally" created habitat that would provide optimal conditions versus marginal or unsuitable conditions for plovers and amaranth should no further stabilization occur. It is possible, however, to determine the linear distance of beach habitats that will be artificially stabilized through the Corps Program activities. Natural coastal processes that create, enhance, and perpetuate piping plover and seabeach amaranth habitat will be curtailed by Corps Program activities for the life of the Program along approximately 74.8 miles of coastline (see Table 13). The Corps Program Area encompasses approximately 101 miles of oceanfront coastline. Therefore, only approximately 26.2 miles or 25.7 percent of coastline within the Program Area

will not be further directly stabilized by Corps Program activities. Of this, many areas have previously been altered by past federal, State, or private stabilization activities or will be indirectly affected by ongoing adjacent Corps projects.

Table 13. Summary of Potential Piping Plover and Seabeach Amaranth Habitat Directly Impacted by New Jersey Shore Protection Projects

PROJECT NAME	APPROXIMATE LINEAR DISTANCE OF SHORELINE IMPACTED (MILES)
Manasquan Inlet to Barnegat Inlet	14.0
Barnegat Inlet to Little Egg Inlet	16.9
Brigantine Inlet to Great Egg Harbor Inlet: Brigantine Island	2.0
Brigantine Inlet to Great Egg Harbor Inlet: Absecon Island	8.3
Great Egg Harbor and Peck Beach	4.5
Great Egg Harbor to Townsends Inlet: Ocean City	2.7
Great Egg Harbor to Townsends Inlet: Ludlam Island	6.5
Townsends Inlet to Cape May Inlet: Seven Mile Island	6.3
Townsends Inlet to Cape May Inlet: Stone Harbor Point	0.2
Hereford Inlet to Cape May Inlet: Five Mile Beach	4.8
Cape May Inlet to Lower Township	3.6
Lower Cape May Meadows to Cape May Point	2.5
Townsends Inlet Seawall	0.6
Hereford Inlet Seawall	1.6
Absecon Inlet Bulkhead and Revetment	0.3
Total	74.8

2. Creation of Sub-Optimal Beach and Dune Habitats

High-quality piping plover and seabeach amaranth habitat is generally characterized by sparse vegetation, a well-developed wrack line, and, for plovers, abundant shell material. These habitat features will most likely return to a nourished beach within one or two nesting / growing seasons, at least in areas not mechanically raked. However, other features of high quality habitat may take longer to develop on a nourished site or may be precluded from forming. Piping plovers

and seabeach amaranth both favor beaches with gentle slopes from the foredune to the water, a configuration that dissipates wave energy and provides a wider inter-tidal plover feeding area. The slope of the beach in the intertidal zone is generally steeper after nourishment until the beach reaches a more stable profile, and a distinct scarp often forms in this zone as the beach fill adjusts (National Research Council, 1995).

Steep, stabilized primary dunes provide unsuitable habitats for piping plovers and seabeach amaranth (Jones, 1997; Weakley and Bucher, 1992). Dunes within the Program Area will typically be constructed at a slope much steeper than those preferred by plovers. For example, recently constructed dunes at Avalon and Stone Harbor on Seven Mile Island were created with a 5:1 (20 percent) slope (U.S. Fish and Wildlife Service, 2002a). Jones (1997) found that the upper beach slope at piping plover nest sites averaged only 5.6 percent, significantly less than random points that averaged 8.3 percent. Jones further found that intertidal slope was also less steep adjacent to nests (11.2 percent) than random points (12.8 percent). Strauss (1989) also found that piping plovers preferentially choose areas with shallower than average foredune slopes for nesting sites. During surveys conducted by Service staff in 2000 and 2001 of seabeach amaranth sites in Monmouth County, New Jersey, no plants were found in stabilized dunes.

The Corps Program includes stabilizing constructed dunes through planting dune vegetation and dune fencing. Unstabilized dunes provide more potential piping plover and seabeach amaranth habitat as they tend to have a more gently sloping foredune face than stabilized dunes. Blowouts (breaks, often formed during storms) in the primary line of unstabilized dunes provide marginal habitat for seabeach amaranth (Weakley and Bucher, 1992) and high quality habitat for piping plovers (Strauss, 1989; Jones, 1997). Inter-dune areas and gently-sloping foredunes provide particularly important habitats when the berm has been narrowed by erosion, as happens following severe coastal storms or towards the end of a recurring sand renourishment cycle.

Densely planted dune vegetation, as has previously occurred within portions of the Program Area, precludes use of such planted areas by piping plovers, limiting the amount of available plover habitat and providing cover for predators. Similarly, dune fencing can promote the formation of steep, uniform dunes. Without guidance provided by the Corps, traditional dune stabilization practices (dense planting of beachgrass and continuous dune fencing) are likely to occur over much of the Program Area. Stabilization of beach and dune habitats is likely to accelerate growth of native and non-native vegetation that will out-compete seabeach amaranth and further reduce habitat suitability for nesting and foraging plovers.

The Corps has included a conservation measure to work cooperatively with the Service and the USDA to develop guidelines for planting and maintaining dune and beach vegetation and erecting sand fence on Corps nourished beaches that are protective of federally listed species. While these guidelines are anticipated to reduce impacts to piping plover and seabeach amaranth, maintenance of beach and dune habitats between nourishment cycles will be undertaken by the non-federal project sponsor (usually the local municipality). Until the guidelines are developed, it is likely that traditional management practices will continue. Even after the new guidelines are available, it is likely that not all municipal beach managers or private landowners will comply

with new or changed management techniques and recommendations and some practices that will reduce endangered species habitat suitability will continue. Further, even in the absence of purposeful dune stablization by planting and fencing, the beaches created by the Corps program often include berm elevations too high to be regularly scoured by storm tides and natural vegetation growth often renders habitat increasingly less suitable with each passing year (*e.g.*, Monmouth Beach, Coast Guard Training Center) (Jenkins, pers. comm., 2004).

The Corps stabilization efforts are specifically targeted to protect areas with commercial or residential development and associated infrastructure. Human use of these developed areas is typically higher than on undeveloped or sparsely developed coastal areas. Periodic nourishment within the Corps Program Area will attract plovers to artificially stabilized beach areas and perpetuate nesting activity in areas where harassment from human disturbance is likely to occur. The Service anticipates that the Corps Program will perpetuate the past productivity that has been observed on stabilized beaches within the Program Area. For the purposes of this analysis, the Service considers stabilized areas to be areas that received beach nourishment during the 5-year period for which data are presented or are areas that have been formed and are protected by hard shoreline stabilization structures; areas where only minor stabilization activities occurred (such as sand fencing or planting of dune vegetation) are included within the unstabilized group of sites. Additionally, the Service recognizes that some areas included as unstabilized may have benefited from sand placement in adjacent areas and that many other natural or man-made confounding factors coincide on stabilized beaches, making it difficult to determine impacts to plover productivity solely attributed to human disturbance.

The 5-year average productivity within the Program Area for the past 5 years (2001-2005) was 0.69 chicks fledged per nesting pair on stabilized beaches as compared to 0.84 chicks fledged per pair on unstabilized beaches (see Table 14). Therefore, productivity on stabilized beaches over the past 5 years has averaged approximately 0.15 chicks per nesting pair lower than on unstabilized beaches. While many factors (*i.e.*, predation, weather, flooding) will affect actual productivity on nesting beaches, the Service anticipates that a similar reduction in productivity on Corps-stabilized beaches will continue throughout the Program Area over the 50-year life of the Program.

The Corps Program will perpetuate the artificial creation and maintenance of suboptimal beach and dune habitats. The creation of sites supporting suboptimal habitats may lead to a reduction in available nesting and foraging habitat for piping plover and suitable habitat for seabeach amaranth colonization.

In the first year (2005) following construction of the Cape May Meadows restoration project, piping plover productivity was 1.60 chicks fledged per pair, well above the statewide average of only 0.77 for that same year (see Table 9). These results show promise that beach nourishment, when combined with habitat enhancement to provide alternate foraging areas, has potential to increase piping plover productivity.

Table 14. Comparison of Five-Year Average (2001-2005) Piping Plover Nesting and Productivity on Beaches that are Stabilized, Unstabilized, and Stabilized with Enhancement Within the Corps' Philadelphia District Program Area

Location	Number of Breeding Pairs	Number of Nests Hatched	Number of Chicks Fledged	Number of Chicks Fledged/Pair (Productivity)
Island Beach State Park - Inlet	1.4	0.4	0.6	0.43
Barnegat Light	3.0	1.8	3.4	1.13
Ocean City - Center	7.6	5.6	4.2	0.55
Strathmere Beach	0.2	0.2	0.0	0.00
Whale Beach	0.2	0.0	0.0	0.00
Sea Isle City	0.2	0.0	0.0	0.00
Avalon- North	0.2	0.2	0.2	1.00
Coast Guard - LSU	1.4	1.0	1.2	0.86
Coast Guard- TRACEN	2.6	2.2	2.2	0.85
Cape May City	0.8	0.6	0.4	0.50
Subtotal – Stabilized Sites Corps Within Philadelphia District Program Area	**17.6**	**12**	**12.2**	**0.69**
Holgate	15.0	10.0	13.8	0.92
Little Beach	15.6	8.8	10.4	0.66
North Brigantine	12.0	6.8	13.2	1.10
Brigantine Inlet	0.2	0.2	0.2	1.00
Ocean City - North	4.0	2.2	3.8	0.95
Corson's Inlet State Park	1.8	1.2	2.4	1.33
Townsends Inlet	1.0	1.0	1.2	1.20
Avalon Dunes	6.4	3.8	5.8	0.91
Stone Harbor Point	7.2	4.2	2.4	0.33
North Wildwood	2.6	2.2	2.0	0.77
Subtotal - Unstabilized Sites Within Corps Philadelphia District Program Area	**65.8**	**40.4**	**55.2**	**0.84**
Cape May Meadows	3.4	3.0	4.4	1.29
Subtotal - Stabilized Sites with Piping Plover Habitat Enhancement Within Corps Philadelphia District Program Area	**3.4**	**3.0**	**4.4**	**1.29**
New Jersey Statewide Total	**130**	**84**	**123.8**	**0.95**

3. Burial of Piping Plover Prey Base

Piping plovers feed on invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks (Bent, 1929; Cairns, 1977; Nicholls, 1989). Prey can generally be divided into two categories: terrestrial invertebrates (chiefly flies and other insects, including diurnally burrowing Talitrid amphipods (Amphipoda) (Gibbs, 1986)), and benthic intertidal infaunal invertebrates.

On oceanfront habitats, terrestrial invertebrates tend to be concentrated in the wrack line (Loegering and Fraser, 1995; Hoopes *et al.*, 1992), a favored piping plover foraging area, particularly for chicks (Goldin, 1993; Hoopes, 1993; Hoopes *et al.*, 1992). Availability of wrack

is especially important at sites where ephemeral pool and bayside foraging areas are not available. The Corps Program will completely remove or bury the wrack line within the construction footprint of each individual project. Impacts to the wrack line and the associated prey base from beach nourishment and activities associated with replacement and extension of the 3 seawalls will be temporary. Except where curtailed by mechanical beach raking or delayed by scarping, partial to complete physical recovery of the wrack line can be expected by the nesting season following completion of seawall construction and each sand nourishment cycle, depending on the timing of the fill activity.

Recovery rates of the terrestrial insect prey resource associated with the wrack line are unknown. Due to beach raking practices occurring within a large portion of the Program Area, the pre-construction wrack line and associated prey resources are most likely already diminished and may slow rates of recovery in newly forming wrack. Recovery of the wrack line will depend on the timing of the fill activity. Wrack can be expected to physically recover rapidly during winter months when storms are plentiful and raking does not occur. However, prey resource re-colonization is expected to be low during the winter period of low invertebrate activity and more rapid during warmer weather. Areas receiving sand in autumn will have a longer wrack recovery period than areas receiving fill in the winter and early spring. While renourishment activities within known piping plover nesting areas will be completed outside of the piping plover nesting season, fill may take place within nesting areas as late as March 14. Therefore, adverse effects in the form of a depressed wrack line prey base for up to one nesting season are anticipated following each nourishment cycle.

Although the exact composition of the benthic invertebrate community throughout the Corps Program Area is not known, many studies have investigated plover use of this prey resource on other Atlantic coastal beaches. On three southern New Jersey beaches, Staine and Burger (1994) found that polycheate (*Scolelepis* spp.) abundance is highest in piping plover foraging areas, and concluded that polychaetes (especially *Scolelepis squamata*) are the plovers' main source of food in these locations. Hoopes *et al.* (1992), Gibbs (1986), and Cairns (1977) also documented that piping plovers feed on polychaetes. Loegering (1992) found amphipods and mole crabs (*Emerita talpoida*) abundant in the saturated intertidal zone of the ocean beach on Assateague Island National Seashore in Maryland, with amphipods comprising approximately 95 percent of samples from these areas. Loegering (1992) and Loegering and Fraser (1995) observed that older chicks and adults often feed in this saturated zone, suggesting that amphipods constitute a prey resource. In an evaluation of benthic prey resources conducted by the Corps in Ocean City, Cape May County, New Jersey, dominant taxa included amphipods and other Haustoridae, coquina clams (*Donax* spp.), and polychaetes (Scott, 2002).

Beach nourishment affects the species' richness, abundance, and biomass at the sand placement area in the short term following the nourishment (U.S. Army Corps of Engineers, 1999). The Service expects that 100 percent of the intertidal infaunal prey base within the construction template will be covered by sand placement. Recovery times are dependent on compatibility of sediments between the existing beach and the fill material, as well as the time of year in which nourishment takes place. For oceanside beach nourishment, the intertidal zone fauna is most affected by nourishment activities (Lynch, 1994). Studies conducted in Florida, North Carolina,

and South Carolina show that recolonization rates by benthic invertebrates are variable and somewhat dependent on the time of year in which the nourishment occurs, beginning within days and taking up to 1 year for full recovery of some species (Reilly and Bellis, 1983; Bacca and Lankford, 1988; Lynch, 1994). The macrofaunal community after recolonization may differ considerably from the original community. Once established, it may be difficult for species of the original community to displace the new colonizers (Hurme and Pullen, 1988).

In a study of the effects of beach nourishment on oceanside intertidal benthos conducted by the Corps in Monmouth County, New Jersey, recovery time of the intertidal infaunal community was as short as 2.0 months following renourishment carried out between early August and early October. Therefore, renourishment during this period will likely have little or no adverse effect on piping plovers due to reduced prey availability. Recovery time following renourishment in mid- to late-October is expected to fall within the range of 2.0 to 6.5 months. Renourishment between November and January would coincide with the period of sharp seasonal decline in abundance, and the infaunal community would not be expected to recover for at least 6.5 months. Renourishment between mid-October and January, therefore, may result in reduced productivity, or possibly abandonment of nesting areas from reduced prey resources (U.S. Army Corps of Engineers, 2001c).

While the aforementioned studies indicate that recovery of benthic prey resources is expected to occur within 1 year of nourishment, such studies did not assess the long-term impacts to prey resources from periodic nourishment over an extensive stretch of coastline such as the Corps Program Area (approximately 74.8 of 101 miles) and over an extended period of time such as 50-year life of the Corps nourishment Program. Each individual nourishment cycle is expected to bury and cause mortality of invertebrate organisms that serve as food resources for piping plovers, thereby depressing food resources for up to one nesting season following each nourishment cycle on each project site. The long-term impacts to prey resources from this repeated cycle are not fully understood and may be impossible to determine because there is no baseline for comparison. After initial nourishment events, the volume of sand deposited and area to be filled will vary depending on erosional trends within each individual project area so the area to be impacted will vary from year to year. Only a portion of the Program Area will receive beachfill in any given year; therefore, areas excluded from all fill activity and areas between fill cycles should serve as reservoirs of source populations for recolonization of wrack line and benthic prey resources. Recovery of prey resources can be expected to start soon after fill placement and to continue until the following nourishment cycle. However, prey species abundance and composition may change over the length of the Corps Program. The effects of such a change in prey species resources on piping plover survival and reproductive success are not fully understood. Furthermore, in reality, it may be very difficult to detect differences due to new sand placement because the natural temporal variability within the coastal ecosystem may mask or confound effects due to renourishment.

4. Beach Management Activities

Following construction, beaches nourished by the Corps Program will be managed by the local municipality or other public or private landowners. Most municipal officials and beach

managers currently work cooperatively with the ENSP and the Service to minimize disturbance to piping plovers, seabeach amaranth and other sensitive beach strand species such as beach nesting birds. However, beach management activities such as mechanical beach raking and sand scraping are expected to continue within a portion of the Program Area following construction. These management activities will continue to affect the piping plover by adversely modifying nesting habitat and removing wrack and intertidal zone benthic prey resources within foraging habitat. Additionally, beach raking and sand scraping may remove seabeach amaranth seeds and plants, resulting in destruction of established plants or precluding colonization of Program Area beaches by seabeach amaranth. Although most municipalities restrict vehicle use to emergency use only in plover nesting areas during the nesting season, municipal staff such as enforcement personnel, lifeguards, and maintenance workers may conduct activities in a manner not in compliance with Service Guidelines, such as driving on the beach to conduct routine law enforcement and lifeguard patrols and to collect trash. Enforcement of pet restrictions within some municipalities has been lax.

Without additional efforts to secure cooperation, death or injury to piping plovers or seabeach amaranth plants could result from beach management actions carried out by the municipalities and other beach managers. As a conservation measure to ensure the protection of federally listed species following project construction, the Corps will require each municipality or other appropriate landowner to prepare site specific endangered species management plans. The management plans will include specific protective measures needed to reduce impacts to federally listed species from beach management activities. The management plans can be expected to reduce, but not totally eliminate disturbance to piping plovers, seabeach amaranth and habitats supporting these species from beach management activities.

5. Recreational Activities

As discussed above with the Beneficial Effects section of this Biological Opinion, the Corps Program has the potential to create suitable habitat for listed species. However, recreational use will be permitted and may increase on beaches receiving sand from the Corps' beach nourishment Program. Cost-benefit justifications influence the Corps decisions regarding where shoreline stabilization projects are most needed. As a result, most beachfill projects are targeted at the most heavily developed sections of New Jersey's coast where recreational use is also often the highest. Newly nourished beaches within the Program Area may lure piping plovers to nest and may confine plovers to the ocean beach where alternate foraging habitat for chicks may be limited. For example, in the Village of West Hampton Dunes, New York piping plover nesting activity on a largely undeveloped low-lying stretch of beach subject to cross-island overwash was heavily concentrated on the bayside of the island, away from prime locations for beach recreation. Following beach nourishment and construction of an artificial dune (which, in turn, facilitated re-development along the center of the island and interrupted overwash to the bayside), the preferred bayside breeding habitats were lost to development and vegetation growth, forcing plovers to shift their breeding activities to the oceanside beach where they experience substantially increased potential for conflict with beach recreation. While only 3 out of 21 nesting attempts (by 21 pairs) occurred on oceanfront beaches in 1996, 27 pairs made 46 out of 49 nest attempts on oceanfront beaches in 2003 (Houghton *et al.*, 2000; Cohen *et al.*,

2003; Hecht, pers. comm., 2004). Creating endangered species habitat in oceanside areas subjected to heavy recreational use can be especially detrimental. Habitat that is physically suitable may create a "population sink" by recruiting individuals to an area each season, only to yield reproduction below replacement levels, due in part to impacts of beach recreation in the same areas as the remaining plover breeding habitat.

Recreational use on nourished beaches within the Corps Program Area ranges from light to intensive. Intensive recreational use tends to be concentrated in the vicinity of lifeguarded municipal beaches, limiting the suitability of many areas as plover habitat. Piping plovers generally occupy beaches receiving no or only light to moderate recreational use. However, wide beaches with little human disturbance at the time plovers initiate nesting (March to April) often experience heavy recreational pressure later in the nesting season (May through August), adversely affecting reproductive success by disturbing nesting birds and preventing adults and young from accessing oceanside foraging habitats. Even moderate levels of human use can create sufficient disturbance to cause abandonment of nests, interfere with foraging, cause broods to be separated from adults, interfere with parental care of chicks, slow development of chicks, or attract predators.

Studies have found a negative correlation between the number of people present within 50 meters of piping plovers and time spent foraging (Burger, 1991). Plovers may spend only 50 percent of their foraging time actually feeding in habitats with many people present, compared to 90 percent in less disturbed areas (Burger, 1994). Flemming *et al.* (1988) found productivity correlated to level of disturbance, with 1.8 chicks per pair in areas of low disturbance compared to 0.5 chicks per pair in areas of high disturbance. However, Hoopes *et al.* (1992) found no correlation between rates of disturbance and productivity rates, and attributed this to intensive management of recreation within his study area, including restrictions on dogs and ORVs and use of symbolic fences to protect nests and provide refuge areas for chicks.

Within Sea Bright and Monmouth Beach, New Jersey, evidence of adverse impacts to seabeach amaranth was obvious in areas of intensive recreational use, such as at beach access paths and a site near a volleyball net. At these sites, amaranth plants were absent within the access paths and the sand volleyball “court,” but were abundant directly adjacent to these high foot-traffic areas. On heavily used beaches, within areas where pedestrian use was prohibited, such as areas symbolically fenced to protect piping plovers and other beach nesting birds, seabeach amaranth was more abundant than in areas regularly subjected to foot-traffic. Service observations suggest that high levels of recreational activity in otherwise suitable habitat can preclude or reduce colonization by seabeach amaranth. Therefore, seabeach amaranth colonization is unlikely to occur on intensively used recreational beaches within the Corps Program Area, and potential for colonization on less intensely used recreational beach areas would be relative to the amount of recreational use occurring.

To minimize the effects of recreational use on nourished beaches, the Corps intends to fund a comprehensive program to monitor and manage piping plover and seabeach amaranth on a yearly basis within each project area, beginning with the first nesting season after initial project construction and continuing for the life of the project or until assumed by the State or local

project sponsor. The Corps has begun implementing this monitoring and management program on project areas where initial construction has been completed, specifically the Great Egg Harbor and Peck Beach, Townsends Inlet to Cape May Inlet (Seven Mile Island), and Cape May Inlet to Lower Township nourishment projects. The monitoring and management program has been effective in abating specific threats from recreational users identified within these areas (see Appendix C). The specific result of this monitoring and management on productivity is difficult to quantify. However, productivity on the monitored and managed beaches can be assumed to be higher than if no actions were taken to identify and restrict access into nest sites and to reduce impacts from human disturbance and other threats. Annual monitoring and management activities include endangered species surveys; on-site education and outreach to beach users; and construction of symbolic fencing and predator exclosures as appropriate in coordination with the ENSP, Service, and municipal managers. In addition, as a conservation measure, the Corps will require each municipality or other appropriate landowner to prepare site specific endangered species management plans. The management plans will include specific protective measures needed to reduce impacts to federally listed species from recreational use.

The Service anticipates that indirect effects to piping plovers and seabeach amaranth will continue to be minimized through intensive monitoring, fencing, and public outreach. This expectation assumes that endangered species management efforts will be adjusted in future years to respond to changes in recreational patterns and/or species conditions. However, even with a monitoring and management program in place to minimize the severity of disturbance, some human disturbance to piping plovers and seabeach amaranth is expected to continue to occur on Corps Program Area beaches where recreational use is permitted. Beaches where recreational use is permitted are likely to support lower numbers of piping plovers and seabeach amaranth and be less productive than sites where recreational use is prohibited.

6. Predation

Beach recreationists often feed wildlife or leave trash that attracts species that prey on piping plovers. Such activities occurring on Corps' nourished beaches could result in losses of plover adults, nests, or young. Predators commonly observed in Corps Program Area beaches include foxes, raccoons, gulls, crows, ghost crabs and feral or free-ranging domestic dogs and cats (Jenkins and Pover, 2001b; Jenkins and Pover, 2002; Turner, pers. comm., 2002; Frie, pers. comm., 2003). There is some circumstantial evidence that predators are more efficient on linear beaches where nest locations are in a highly predictable line along the foot of the dune (Hecht pers. comm., 2004). On Long Island south shore barrier beaches, red foxes use dunes as denning sites. By confining piping plover breeding areas to these narrow predictable bands of linear oceanside habitat, efficiency of red fox and other predators may be increased as compared to sites with wider, irregular barrier island features that may allow piping plovers to be more efficient in eluding predators (U.S. Fish and Wildlife Service, 2003c).

Piping plovers within the Program Area are currently protected from avian and mammalian predation through management actions undertaken by ENSP, Service, The Nature Conservancy, and, at some sites, municipal staff. Management includes use of predator exclosures around plover nests, close monitoring, and, where necessary, predator removal by staff or private

contractor. In addition, as a conservation measure to ensure the protection of federally listed species, the Corps will require each municipality or other appropriate landowner to prepare site-specific endangered species management plans. The management plans will include specific protective measures needed to reduce impacts to federally listed species from predation on Corps project sites. Overall, the Corps Program is not expected to increase piping plover losses due to predation from avian or mammalian predators.

At some sites, such as the Holgate Unit of Edwin B. Forsythe NWR, Avalon Dunes, and Cape May Meadows Migratory Bird Refuge, predation by ghost crabs is becoming an increasing concern (Turner, pers. comm., 2002; Jenkins and Pover, 2002;). Following several mild winters, ghost crab numbers, as well as the size of individuals, appear to be increasing at the Cape May Meadows nesting site. Monitoring of ghost crabs in 2001 at Cape May Meadows demonstrated that ghost crabs use existing berms constructed by the Corps and the NJDEP as winter hibernaculum. The crabs emerge from the berm in the spring and move their burrow sites shoreward as the season progresses (Patt, pers. comm., 2002).

Predation of newly hatched piping plover chicks by ghost crabs has been documented within the Corps Program Area at the Cape May Meadows Migratory Bird Refuge (Frie, pers.comm., 2003) and is suspected at the Holgate Unit of Edwin B. Forsythe NWR and Avalon Dunes nesting sites (Turner, pers. comm., 2002; Jenkins and Pover, 2002). Similar observations of ghost crab predation on piping plover chicks and eggs have been recorded at Assateague Island National Seashore in Maryland and along the Virginia barrier islands (Loegering, *et.al*., 1995; Watts and Bradshaw, 1995). A study by Wolcott and Wolcott (1999) at Assateague Island in Virginia concluded that, although ghost crabs were not a major cause of piping plover chick or egg losses, adult plovers did perceive the crabs as potential predators. Adult plover defensive responses to ghost crabs may carry an energetic cost to adults, alert other avian or mammalian predators to the location of plover broods or nests, and cause adults to a lead broods away from prime foraging habitat into areas with less abundant foraging resources (Wolcott and Wolcott, 1999).

Ghost crabs are most abundant on high energy beaches backed by high dunes. High dunes provide overwintering habitat in which crabs can burrow below their lethal isotherm (6-8° C) before being blocked by the water table (Wolcott and Wolcott, 1999). Corps Program activities that further stabilize beach berms and create or maintain stabilized dunes may create additional refugia to host overwintering ghost crabs, facilitating expansion of ghost crab populations. As a result, ghost crab predation of chicks and eggs or disturbance to adult plovers may increase on Corps nourished beaches, reducing plover reproductive success.

D. CUMULATIVE EFFECTS

Cumulative effects include the impacts of future State, local, or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future federal actions that are unrelated to the proposed action are not addressed here because they require separate consultation pursuant to Section 7 of the ESA.

Within the New York-New Jersey piping plover Recovery Unit and the entire range of seabeach amaranth, shoreline stabilization and development are considered the most significant threats to these species. The effects of a stabilized shoreline on federally listed species are significant and long-lasting; however, the extent to which the Corps Program contributes to the perpetuation of shoreline stabilization over existing baseline conditions is difficult to quantify. The hard stabilization structures proposed as part of the Corps Program replace and modestly extend existing hard structures. The remaining existing stabilization structures in the Program Area have been in place for many years, in some cases decades and have been routinely maintained. Many coastal communities have periodically nourished oceanfront beaches in partnership with the NJDEP. Economic consideration of the extensive upland infrastructure and development receiving storm protection from the existing hard structures further suggests that abandonment is unlikely in the foreseeable future. Absent the Corps proposed long-term periodic nourishment of sandy beaches, it is likely that many additional hard stabilization structures would be constructed by non-federal entities to protect and maintain existing developed infrastructure within New Jersey established coastal communities. Projects needing federal authorization would constitute future federal actions and will be addressed in separate consultation or appended to this Biological Opinion. Those activities not needing a federal permit can be expected to result in cumulative impacts similar to those addressed within this Biological Opinion, specifically stabilization of existing residential and commercial development and associated infrastructure will preclude natural erosive and depositional processes from maintaining or creating additional suitable habitat for piping plovers and seabeach amaranth.

Within the Corps Program Area, further development of adjacent uplands and increased recreational beach use is reasonably certain to occur. Further development of upland portions of New Jersey's Atlantic coastal islands will continue to preclude formation of prime piping plover breeding habitat such as overwash areas and reduce suitable seabeach amaranth growing areas. Stabilization of upland areas with non-native vegetation is likely to occur and will provide a seed source that may exacerbate growth of non-native vegetation on dune and beach habitats, reducing or eliminating available suitable plover and amaranth habitat. Many smaller homes on New Jersey's barrier islands are being torn down and replaced with larger multi – unit houses, apartments or condominiums, increasing the number of recreational users visiting or permanently relocating to the New Jersey shore. Demands for recreational use of coastal beaches will likely continue to increase and subsequently increase disturbance to piping plover and seabeach amaranth and damage or destruction to habitats supporting these species.

VII. CONCLUSION

After reviewing the current status of the piping plover and seabeach amaranth, the environmental baseline for the action area, the effects of the Corps Program activities, and cumulative effects, the Service's Biological Opinion is that the Corps Program is not likely to jeopardize the continued existence of the piping plover or seabeach amaranth. No Critical Habitat has been designated for these species; therefore, no Critical Habitat will be affected.

"Jeopardize the continued existence" of a species "means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery in the wild by reducing the reproduction, numbers, and distribution of that species (50 CFR 402.02)." The Corps program contributes, both directly and indirectly, to the vulnerability of the Atlantic Coast piping plover population and the New York - New Jersey Recovery Unit in particular.

Numbers of piping plovers are limited by the carrying capacity of habitat, as well as the availability of birds to fill it. The Corps Program perpetuates the long-standing sequence of hard coastal structures and extensive development that preclude natural coastal processes from creating optimal piping plover habitats in the Program Area. A complex history of past inlet stabilization and beach nourishment projects and effects that may accrue to habitat updrift and downdrift make it difficult to closely correlate stabilization activities with carrying capacity, which is also confounded by probable under-utilization of habitats due to low productivity. Nonetheless, it is clear that stabilized habitats in the Program Area supported a far lower density of piping plovers in 2001-2005 compared with unstabilized habitats (approximately 18 pairs on average over 75 miles of stabilized habitat, versus 66 pairs on 23.5 miles of unstabilized habitat; Tables 13 and 14). The Program will provide some benefits by creating, maintaining, and enhancing suitable habitat within the portions of the Program Area. Contributions to carrying capacity, along with measures to improve productivity (see discussion below) are anticipated to ameliorate this situation to some extent, thereby increasing the total population in the Program Area. Population gains will reduce the piping plover's current vulnerability to extinction by increasing its buffer against short-term fluctuations in survival and productivity. Conservation measures included in the Program description to reduce the direct effects of beach nourishment (*e.g.*, avoidance of nesting areas during the breeding season) are also very important to maintaining habitat carrying capacity for piping plovers. Numbers of piping plovers are also very sensitive to changes in adults and juvenile survival rates. It is difficult to expressly apportion and quantify specific impacts of factors affecting survival rates, but effects of the Program that detract from fitness (*e.g.*, disturbance, reduced prey) or minimize these effects are likely to affect piping plover numbers.

Reproductive success of piping plovers is also lower on stabilized habitats within the Program Area (Table 14). Implementation and success of conservation measures designed to minimize the indirect and/or cumulative effects due to human disturbance and predation are crucial to attainment of productivity rates necessary to sustain a persistent piping plover population. In

light of the low density of breeding piping plovers in stabilized areas, extension of recreation and predator management to the entire Program Area is very important. Management must be consistently implemented to foster high productivity and avoid, to the maximum extent possible, periods of substandard productivity to which small populations are particularly vulnerable. Because Atlantic Coast piping plovers have high rates of fidelity to their natal region, productivity is also closely tied to numbers of breeding pairs in subsequent years.

The Program also affects the distribution of piping plovers in ways that affect the species likelihood of survival and recovery. Both banding and genetic data indicate slow rates of dispersal within the Atlantic Coast piping plover population. Stabilized habitats support low densities of piping plovers, reducing opportunities for dispersal to other sites within the Program Area and to Delaware and northern New Jersey if unfavorable circumstances in these areas drive populations to very low numbers.

As noted in the Vulnerability to Extinction section above, the duration of the Program raises special concerns for the survival of piping plovers. Extinction risk connotes a probability of extinction over a given time period. As the time period of exposure is extended, the cumulative probability that extinction will be realized increases. The 50-year duration of the Program, therefore, is of special concern because it perpetuates conditions that have led to low piping plover abundance, density, and productivity.

The Service's evaluation of the effects of the Corps Program on federally listed species was based largely on a Program description that includes an extensive set of conservation measures to avoid or minimize most significant direct and indirect effects to piping plovers and seabeach amaranth. The Corps proposes to include these conservation measures as part of its agency action; therefore, they were considered as an integral part of the Program and are nondiscretionary. Additionally, the Corps will conduct further informal or formal consultation, as necessary, on individual projects implemented within the Program Area to address any site-specific project or species concerns not anticipated within this programmatic consultation. These consultations and annual program reviews will provide opportunities to assess the efficacy of Program conservation measures and implications for survival and recovery of piping plovers.

VIII. INCIDENTAL TAKE STATEMENT

A. DEFINITION OF INCIDENTAL TAKE

Section 9 of the ESA and the federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. *Take* is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. *Harm* is further defined by the Service to include significant habitat modification or degradation that results in the death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. *Harass* is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. *Incidental take* is defined as take that is incidental to, and not the purpose of carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered a prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

B. EXTENT OF ANTICIPATED TAKE

Sections 7(b)(4) and 7(o)(2) of the ESA do not apply to the incidental take of federally listed plant species; therefore, no incidental take statement, and subsequently no reasonable and prudent measures nor terms and conditions, are provided within this biological opinion for seabeach amaranth.

1. Anticipated Take from Direct Effects

The individual projects proposed under the Corps Program will avoid nourishment, construction, and other Program-related activities within known piping plover breeding areas during the nesting season (March 15 to August 15). All beach nourishment, seawall construction, and operations and maintenance activities taking place adjacent to plover breeding areas during the nesting season will incorporate conservation measures, such as sufficient buffers and monitoring, into individual project designs to avoid death or physical injury to piping plover adults, nests, or chicks within known or newly detected nesting areas. Even with the strong programmatic conservation measures proposed by the Corps, occasional failure to detect nesting or foraging piping plovers, occasional lapses in strict adherence to conservation measures, and occasional breakdown in communication and coordination among Service, Corps, NJDEP, municipal, construction and monitoring staff is likely to occur over the 50-year life of the Corps nourishment projects and the duration of Corps maintenance of existing hard shoreline structures. Such inconsistencies could cause direct harm to the species and result in unintentional death or injury to piping plover adults, eggs, or young.

The Corps will conduct further informal or formal consultation, as appropriate, on individual projects that may affect the piping plover. The Service anticipates that such future project-specific consultation will further reduce harm to the species. Therefore, the Service anticipates

that the direct effects of Corps Program activities causing harm will result in loss of no more than 1 piping plover adult over the entire 50-year life of the Program and no more than 1 piping plover nest or brood per nesting season in each of the 50 years of the Program life.

Additionally, if buffer areas prove to be insufficient, or failure to adhere to all conservation measures occurs, take related to the direct effects of construction activities may occur in the form of harassment. If undetected nests or broods are present in nontraditional nesting areas, take may occur in the form of harassment of courting and foraging birds or preclusion of nest initiation. If properly implemented, conservation measures proposed by the Corps would limit the extent of this take to no more than one disturbance event per pair/individual/brood each year. Furthermore, although piping plover nesting typically occurs within the March 15th to August 15th time period, occasional early arrival of breeding adults may occur and fledging of chicks may occasionally occur as late as August 30th. Take in the form of harassment of these early season adults or late fledging chicks may occur. Harassment from the direct effects of Corps Program activities is expected to result in loss of no more than 1 piping plover nest or brood per nesting season in each of the 50 years of the Program life.

In total, loss of no more than 1 adult from harm over 50 years and 2 nests or broods per nesting season from a combination of harm and harass are anticipated from the direct effects of the Corps Program activities. The expected lost productivity from the 2 nests or broods (based on the 5-year average productivity within the Program Area of 0.82 chicks fledged per year per pair) is no more than 1.64 fledglings lost per year in each of the 50 years of Program life.

While the Corps has anticipated the average cycle for each nourishment project, the actual nourishment cycle will be dependent on the amount of erosion occurring within each project area. Additionally, beach nourishment, construction, and operations and maintenance activities will be dependent on the availability of funding for project implementation. Therefore, the number of individual projects within the Program Area occurring in any one calendar year will vary and in some years, no projects may be under construction that will result in take of plovers. Thus, the number of fledglings lost per year from the direct effects of the Corps Program is anticipated to range from none to no more than 1.64 fledglings.

2. Anticipated Take from Indirect Effects

The Service anticipates that the indirect effects of the action will also result in incidental take of piping plovers. Such incidental take of piping plovers will occur in the form of harm from adverse habitat alteration and diminished prey resources, and harassment from disturbance by beach management activities and beach recreation.

The Corps shoreline stabilization Program will result in incidental take through habitat alteration by curtailing natural coastal processes that revitalize or create optimal piping plover nesting and foraging habitats such as overwash zones, tidal pools, natural dunes, and newly forming inlets. By precluding formation of these preferred habitats, the Corps Program reduces the amount and quality of available piping plover nesting and foraging habitat within the Program Area. Any attempt to quantify numbers of piping plovers impacted by habitat alteration would be

speculative. Therefore, incidental take attributed to harm from adverse habitat modification is quantified as the amount of potentially suitable habitat to be affected. The Service anticipates that the Corps Program may forestall natural coastal processes, perpetuate artificial stabilization, and / or facilitate additional upland development along much of the approximately 74.8 miles of ocean and inlet beachfront within the Corps Program area. However, due to past federal or non-federal stabilization and / or development of the New Jersey shoreline, much of the oceanfront is narrow, eroded or scarped, subjected to heavy recreational pressure or flooding, or otherwise currently suboptimal as piping plover breeding habitat. Consequently, the Corps Program may increase beach width and elevation in some areas and thus provide some additional plover breeding habitat. Nevertheless, by further stabilizing the shoreline, the Corps Program will perpetuate suboptimal habitat conditions along portions of 74.8 miles of shoreline over a 50-year period. The Corps environmental restoration projects will offset losses of breeding habitat at Stone Harbor Point and at Cape May Meadows Migratory Bird Refuge. In addition, the Corps conservation measure to develop guidelines for planting vegetation and maintaining dune and beach habitats on Corps nourished beaches will reduce future beach management practices that are incompatible with formation of suitable piping plover habitat.

Additionally, depending on the season in which beach nourishment occurs, full recovery of wrack line and benthic intertidal prey resources within the area receiving fill may take as long as several months to 1 year following each renourishment event. As a conservation measure to allow recovery of prey resources, the Corps will schedule or sequence fill placement in plover nesting areas to permit as much time as possible between completion of fill activities and the beginning of the nesting season. However, occasional bad weather or equipment failure could result in delays, extending construction closer to the nesting season. Therefore, the Service assumes a worst-case scenario where nourishment in plover nesting areas is completed just prior to the beginning of the plover nesting season. While such a schedule could result in diminished wrack and intertidal benthic prey resource availability for the majority of one full nesting season, the nourishment events are typically discontinuous throughout the Program Area and within each project area, increasing the likelihood that recolonization of prey resources from adjacent unaffected source populations will occur in a reduced amount of time. Since construction activities could cease in piping plover nesting and buffer areas as late as mid-March, only a short period of prey resource recovery may occur prior to nest initiation, and only 2 months of prey recovery may occur prior to hatching of chicks.

Each individual nourishment cycle is expected to bury and cause mortality of invertebrate organisms that serve as food resources for piping plovers, thereby depressing food resources for up to one nesting season following each nourishment cycle on each project site. It would be speculative to predict the extent of habitat that would be impacted or number of piping plover adults or young that would be harmed in a given nesting season or the cumulative effects to prey resource availability from periodic prey reduction over the 50-year life of the Program. Therefore, incidental take attributed to harm from habitat degradation through reduction of prey resources will be quantified as the cumulative amount of potentially suitable habitat to be affected over the Program life. The Service anticipates that the Corps Program would degrade piping plover habitat by the cyclical reduction in prey resources along non-continuous portions of approximately 74.8 miles of Program Area ocean and inlet beachfront for a period of 50 years.

In any nesting season, only the portion of the Program Area receiving nourishment within the prior year period would be expected to be degraded.

Periodic nourishment within the Corps Program Area will attract plovers to artificially stabilized beach areas and perpetuate nesting activity in areas where harassment from human disturbance is likely to occur. Conservation measures proposed by the Corps will minimize the severity of human disturbance; however, take in the form of harassment can be anticipated from disruption of nesting, brood rearing, and foraging activities. The Service anticipates that the Corps Program will perpetuate the past productivity that has been observed on stabilized beaches within the Program Area.

The 5-year average productivity within the Program Area for the past 5 years (2001-2005) was 0.69 chicks fledged per nesting pair on stabilized beaches as compared to 0.84 chicks fledged per pair on unstabilized beaches (see Table 14). Therefore, productivity on stabilized beaches over the past 5 years has averaged approximately 0.15 chicks per nesting pair lower than on unstabilized beaches. While many factors (*i.e.*, predation, weather, flooding) will affect actual productivity on nesting beaches, the Service anticipates that a similar reduction in productivity on Corps-stabilized beaches will continue throughout the Program Area over the 50-year life of the Program.

The number of piping plover pairs nesting statewide in New Jersey over the past 5 years has fluctuated by nearly 15 percent above or below the 5-year average (see Table 9). Such fluctuations in numbers of nesting pairs can be expected to continue. Therefore, the Service anticipates that the number of nesting pairs on stabilized beaches in the Corps Program Area over the next 5 years will range from approximately 15.0 to 20.2 piping plover pairs. Reduced productivity in these pairs attributed to perpetuation of low productivity from harassment on Corps-stabilized beaches will result in loss of between 2.25 to 3.03 piping plover chicks per year (based on lost productivity of 0.15 chicks per pair). Given the many factors that could affect piping plover populations on Corps Program Area beaches, any attempt to quantify the number of chicks lost from reduced productivity beyond the next 5 years (2006-2010) would be speculative. Therefore, take attributed to lost productivity from the indirect effects of the Corps Program is quantified for the next 5 years of the Program only (2006-2010); beyond 2010 take is not quantified within this Biological Opinion and must be re-evaluated within 5 years of issuance of this Opinion.

Once completed, the Corps restoration projects at Stone Harbor Point and Cape May Meadows are anticipated to result in an increase in productivity by reducing plover losses attributed to flooding and by increasing the amount of available nesting and foraging habitat. The positive benefits of these restoration projects will likely aid in recouping losses from other Corps Program activities in future years.

3. Summary of Anticipated Take

Loss of no more than 1 adult piping plover from harm over 50 years and 2 piping plover nests or broods per nesting season from a combination harm and harass are anticipated from the direct effects of the Corps Program activities. The expected loss of productivity from the 2 nests or broods (based on the 5-year average productivity within the Program Area of 0.82 chicks fledged per year per pair) is no more than 1.64 fledglings lost per year in each of the 50 years of Program life.

The indirect effects of the Corps Program are anticipated to result in harm in the form of reduced habitat quality along 74.8 miles of oceanfront beach over the 50-year Program life. Additionally, harm and harassment from disturbance by beach management activities and beach recreation will result in reduced productivity amounting to a loss of no more than 2.25 to 3.03 piping plover fledglings per year over the next 5 years. Incidental take attributed to lost productivity from the indirect affects of the Corps Program beyond 2010 is not quantified within this Biological Opinion.

C. EFFECT OF THE TAKE

The Service has determined that the level of take anticipated, as described above, from the Corps Program is not likely to result in jeopardy to the species or destruction or adverse modification of Critical Habitat.

D. REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

Reasonable and prudent measures (RPMs) are measures considered necessary or appropriate to minimize the amount or extent of anticipated incidental take of the species. The Service has concluded that the below RPMs are necessary and appropriate to minimize take of piping plovers. In order to be exempt from the prohibitions of Section 9 of the ESA, the Corps and its contractors or cooperators, and / or permittees must comply with the below terms and conditions, which implement the RPMs and outline monitoring and reporting requirements. The RPMs and associated terms and conditions are nondiscretionary, and must be implemented by the Corps. Each RPM is listed in italics, followed by the numbered terms and conditions that implement each RPM.

The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps: (1) fails to demonstrate clear compliance with the RPMs and their implementing terms and conditions in this Biological Opinion; or (2) fails to require Corps staff, contractors, cooperators, and / or permittees to adhere to the terms and conditions of the incidental take statement; and/or (3) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

RPM 1: *Ensure that all Corps project engineers, staff, contractors, cooperators, and / or permittees are fully informed and compliant with all conservation measures contained within the Program description,RPMs, and terms and conditions of this Biological Opinion.*

RPM 1: Terms and Conditions

1.1 Provide all Corps project engineers, staff, contractors, cooperators, and / or permittees with a written summary of all relevant Conservation Measures contained within the Program Description, RPMs, and Terms and Conditions of this Biological Opinion and maps of current piping plover nesting areas for each project carried out within the Corps Program Area.

1.2 Schedule a pre-construction meeting between the Service, Corps planning staff and supervisors, field monitor(s), and appropriate project engineers, contractors, and construction staff to discuss implementation of Conservation Measures and Terms and Conditions for all projects where piping plovers may be adversely affected.

RPM 2: *Ensure that the piping plover construction monitor is qualified to identify piping plovers and their habitats.*

RPM 2: Terms and Conditions

2.1 Develop a qualification standard and description of responsibilities for the piping plover construction monitor in coordination with the Service and ENSP.

2.2 Provide the Service and the ENSP with an opportunity to review the piping plover construction monitor's qualifications to ensure that the monitor is experienced and qualified to conduct piping plover monitoring and management activities.

RPM 3: *Ensure that efficient and effective communication and coordination occurs among Corps project engineers, staff, contractors, cooperators, piping plover construction monitor and / or permittees and the Service, NJDEP, municipal, and any other construction and monitoring staff.*

RPM 3: Terms and Conditions

3.1 Develop a 24-hour per day contact notification protocol for each individual project carried out under the Corps Program. The protocol will designate primary and alternate staff points-of-contact, including the Corps project construction engineer, Corps project biologist, Service and ENSP representatives, and piping plover and construction monitors. Provide a copy of the notification protocol to all appropriate Corps, Service, and ENSP staff, contractors, and field monitors.

3.2 Develop project-specific operating procedures requiring that, when unfledged chicks are present in the project area, work proceed only when a Corps' qualified monitor determines daily that no plovers are present within established buffer areas. Monitors must maintain a daily log confirming the location of all known unfledged broods through coordination with the ENSP or direct visual contact. Observations must be made from a suitable distance to prevent disturbance. If observations indicate any plover broods showing signs of high mobility (movement of 500 meters or more in a 24-hour period) no work should proceed unless a qualified monitor is on site to track brood movement.

RPM 4: *Practice adaptive management of projects within the Program Area and adjust protective measures as needed or as new information becomes available.*

RPM 4: Terms and Conditions

4.1 If, upon notification by the Service, the ENSP, or the local field monitor, fledging of chicks is anticipated to extend beyond August 15th, provide all project staff and contractors with written notification to ensure that no work occurs within 1,000 meters of unfledged chicks or, if site conditions allow, within a reduced buffer area to be determined on a case-by-case basis.

4.2 Conduct annual agency coordination meetings to discuss upcoming Corps projects that may affect plovers. Review any breakdown or errors in communications or coordination that occurred over the past year and work cooperatively to resolve issues.

4.3 At least every 5 years, conduct a review of the Corps conservation measures and the status of the species within the Program Area. Adapt conservation measures as needed.

RPM 5: *Ensure that the Corps piping plover monitoring and management program is sufficient to monitor and minimize disturbance to nesting piping plovers from recreational users on Corps Program Area beaches.*

RPM 5: Terms and Conditions

5.1 Evaluate the piping plover monitoring and management program annually, and, with Service and ENSP input, adapt the program as needed to minimize disturbance from recreational and municipal activities occurring on Program Area beaches. 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 (*i.e.*, more or less effort than one full-time, seasonal, local monitor per project area may be needed).

5.2 In areas of moderate and high recreational use, all suitable piping plover nesting habitat should be delineated by a qualified piping plover monitor, using posts and warning signs or symbolic fencing, on or before April 1 of each year.

5.3 The annual monitoring program shall require that piping plover nesting areas be monitored at least twice per week prior to May 1, and not less than three times per week thereafter,

and

be monitored daily during the nesting season whenever large numbers of pedestrians are on the beach near nesting areas or essential vehicles are used on a regular basis (*i.e.*, monitor every day that law enforcement or lifeguard vehicular patrols occur).

5.4 Document locations of territorial or courting plovers, nest locations, and observations of any reactions of incubating birds to pedestrian or vehicular disturbance.

RPM 6: *Seek ways to preserve or enhance piping plover habitat within the Program Area while meeting shore protection goals.*

RPM 6: Terms and Conditions

6.1 Retain tidal pools and upper beach wet swales throughout the Program Area and especially within piping plover nesting and foraging areas, except where conditions would present a public health or safety hazard.

6.2 Evaluate the effectiveness of the environmental restoration projects at Stone Harbor Point and Cape May Meadows in enhancing piping plover habitat and refine or revise construction plans as necessary.

6.3 Enhance piping plover habitat on stabilized beaches by incorporating features (*i.e.*, alterative feeding habitats, overwash areas, segmented dunes, sparsely vegetated beach berm) into future beach nourishment / stabilization cycles.

RPM 7: *Ensure that dune and beach management actions carried out by the State and local project sponsors and / or permitees over the life of the Program are compatible with piping plover habitat requirements.*

RPM 7: Terms and Conditions

7.1 Review and revise the Operations and Maintenance Manuals for Corps nourished / stabilized beaches to ensure that conservation measures for the protection of the piping plover and its habitat are included within site-specific beach management plans to be implemented by the local municipality or other landowner. The beach

management plan should include a provision that mechanical beach raking and removal of natural organic materials in front of and within 100 meters of nesting areas be prohibited. Litter may be manually removed from the wrack line.

7.2 Once developed, distribute beach and dune management guidelines to land managers throughout the Program Area and ensure conformity with the guidelines on Corps project sites throughout the life of the project. Incorporate guidelines, as appropriate into future Corps construction contracts. The guidelines should specifically address vegetation planting and sand fencing. Ensure that only native non-woody vegetation is planted in oceanfront dune areas.

7.3 Periodically review sand fencing and vegetation planting practices on Corps project sites and take action to rectify any problem areas identified.

RPM 8: *Secure increased cooperation and participation of local beach managers in endangered species protection to augment conservation measure commitments summarized in the Program description.*

RPM 8: Terms and Conditions

8.1 Work cooperatively with municipal officials or other appropriate land managers on each Program Area project site with piping plovers to ensure development and implementation of site–specific endangered species management plans. At a minimum, the plans must be consistent with the Service's 1994 *Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitats on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act,* and must address issues including but not limited to: symbolic fencing (on both public and private portions of the beach), mechanical beach raking, mechanical beach scraping, trash collection and beach clean-ups, sand fencing, vegetation planting and management, predator control, operation of municipal vehicles, and enforcement of pet laws. Additionally, plans must be consistent with State Coastal Zone regulations and should be reviewed and approved by the Service and the ENSP.

RPM 9: *Report on the progress of the action and its impact on the species, as required pursuant to 50 CFR 402.14(i)(3).*

RPM 9: Terms and Conditions

9.1 Monitor the long-term impacts of sand nourishment on abundance, biomass, and species composition of piping plover prey resources within the Program Area. Identify at least one project area that will be monitored over the long term, preferably for 2 years pre-construction, and post construction following the initial fill event, and renourishment cycles 1, 3, and 5. Coordinate with the Service and ENSP to develop the monitoring protocol.

9.2 Report any direct incidental take from Program activities to the Service within 1 working day. Through the annual piping plover monitoring program, document and annually report any observed indirect incidental take of piping plovers from recreational activities and beach management practices on Program Area beaches.

9.3 Exercise care in handling any specimens of dead piping plover adults, young, or non-viable eggs to preserve biological material in the best possible state. In conjunction with the preservation of any specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead or non-viable specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective.

The discovery of a dead bird must be reported to the following Service Law Enforcement office:

Senior Resident Agent
U.S. Fish and Wildlife Service
Division of Law Enforcement
Sea Land Building, 2nd Floor
1210 Corbin Street
Elizabeth, New Jersey 07201
(973) 645-5910

The discovery of an abandoned nest or non-viable egg specimen must be reported to the following Service office:

Supervisor
U.S. Fish and Wildlife Service
New Jersey Field Office
927 N. Main Street, Bldg. D
Pleasantville, New Jersey 08232
(609) 646-9310

The RPMs, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the aforementioned level of incidental take is exceeded, such incidental take would represent new information requiring reinitiation of consultation and review of the RPMs provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs. The Service will not refer incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712) if such take is in compliance with the terms and conditions specified herein.

IX. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or Critical Habitat, to help implement recovery plans, or to develop information. The following conservation recommendations are directed to the Corps as the lead federal authority for this action.

(1) Ensure that impacts to State-listed endangered beach nesting birds (*i.e*, least tern and black skimmer) from Program-related activities are minimized. In addition to the positive benefits to these species that would result from such protection, piping plovers nesting within or adjacent to tern colonies may benefit from the defensive behaviors against avian predators that is typical of this colonial species.

(2) Schedule and implement beach nourishment and associated project activities to avoid construction within 300 meters of least tern and/or black skimmer colonies during the nesting season. The least tern nesting season is generally late May to late August; the black skimmer nesting season is generally early June through September.

(3) Include protection of least terns and black skimmers within endangered species management plans.

(4) Monitor and evaluate the Stone Harbor Point restoration project to determine the effectiveness of the project design and the responsive use of the site by least tern and black skimmer.

(5) Prohibit sand fencing or dense planting of vegetation that would adversely alter potentially suitable seabeach amaranth habitat. Provide guidance to the State and local project sponsors regarding density / spacing of beachgrass plantings in potential seabeach amaranth habitat.

(6) Fence areas (as proposed within the conservation measures) and prohibit mechanical beach raking and sand scraping within 10 meters of any seabeach amaranth plants found within the Program Area. Restrict operation of municipal vehicles in seabeach amaranth areas.

(7) Monitor the effectiveness of any conservation measures implemented to offset losses of seabeach amaranth. In particular, if implemented, monitor the effectiveness of transplantation, seed collection and re-seeding, and / or stockpiling and re-spreading of surface sand.

X. INDIVIDUAL PROJECT CONSULTATION

Individual Corps projects or actions carried out under the Corps Program must undergo individual (Tier 2) consultation to ensure consistency with programmatic conservation measures outlined within the Corps Program description and the RPMs and Terms and Conditions of this programmatic Biological Opinion. This programmatic consultation will be implemented in the following manner for Tier 2 consultation on individual projects or actions carried out under the Corps Program.

(1) The Corps will submit a letter requesting consultation on the proposed individual project or action. The Corps request will include the following: (a) a brief description of the project or action and a map showing the location; (b) a determination of whether or not the project or action may affect federally listed species or their habitat; (c) a summary of any anticipated deviation from the Corps programmatic conservation measures or the RPMs and terms and conditions of this programmatic Biological Opinion; (d) an analysis of the effects of the project or action on federally listed species and their habitat, and (e) a summary of any new relevant information or other factors not considered during the programmatic consultation.

(2) The Service will review the proposed project or action to determine: (a) if the project or action is "not likely to adversely affect" federally listed species; (b) if the effects of the project or action are encompassed by this programmatic Biological Opinion; or (c) if the project or action needs a separate Biological Opinion. During individual streamlined consultations the Service, in coordination with ENSP, will provide the Corps with information and maps defining the nesting areas in proximity to the target construction area and the boundaries of the associated buffer areas.

(3) If the project or action may affect, but is not likely to adversely affect federally listed species, the consultation will be concluded through informal consultation.

(4) If the project is likely to adversely affect federally listed species and the effects of the project or action and any associated anticipated incidental take are encompassed by this programmatic Biological Opinion, the Service will provide a streamlined formal consultation and will quantify the anticipated incidental take associated with the specific project or action. The regulations which implement Section 7 allow the Service up to 90 days to conclude formal consultation and an additional 45 days to prepare a Biological Opinion. However, because this programmatic Biological Opinion streamlines the process, the Service anticipates that streamlined formal consultation and issuance of a streamlined Biological Opinion we be concluded in less time and often within 30 days.

(5) If the Corps or the Service determine that the potential effects of a proposed project or action, including the indirect, interrelated and interdependent effects, are too great for the action to be covered by this programmatic Biological Opinion, or if the project or action falls outside the scope of this programmatic consultation, the Corps will initiate separate formal consultation and the standard provisions for Section 7 consultation (*i.e.*, submission of a full Biological Assessment by the Corps, up to 90 days to conclude formal consultation, and an additional 45 days for the Service to prepare a Biological Opinion) will apply throughout the remainder of the review process.

XI. ADMINISTRATION OF THE PROGRAMMATIC BIOLOGICAL OPINION

Annually, the Service will evaluate the effects of actions that have occurred under this programmatic consultation to ensure that the continued implementation of Corps Program does not result in long-term adverse effects to the piping plover or seabeach amaranth and the habitats upon which these species depend. If unanticipated adverse effects to listed species are identified, new species are listed, or additional federally listed species are documented to occur within the Corps Program area, the Service will request that the Corps re-initiate formal programmatic consultation. This Biological Opinion may be modified or amended to address additional adverse effects to listed species that have not been previously evaluated.

The Incidental Take Statement provided within this Biological Opinion does not quantify incidental take attributed to lost productivity from the indirect affects of the Corps Program beyond the 2010 piping plover nesting season. Prior to the 2011 piping plover nesting season, the Corps must request an amended Incidental Take Statement and must provide an updated schedule of anticipated projects or actions to be carried out under this programmatic Biological Opinion for the upcoming 5-year period (or other appropriate period as mutually agreed upon by the Service and the Corps). Following review of the Corps updated project schedule, the current status of the species within the Program Area, and the potential effects of the Corps Program, the Service will provide an amended Incidental Take Statement or, if appropriate, recommend that the Corps re-initiate formal programmatic consultation.

XII. REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the effects of beach nourishment, renourishment, stabilization, and restoration projects funded, permitted, or conducted by the Corps Philadelphia District along the Atlantic Coast of New Jersey. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or Critical Habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or Critical Habitat that was not considered in this opinion; or, (4) a new species is listed or Critical Habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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Appendix A.

Definitions of Piping Plover and Seabeach Amaranth Terminology

DEFINITIONS

Piping Plover and Seabeach Amaranth Terminology

Adaptive Management: A process that allows systematic modification of management actions to ensure that predefined resource objectives (*e.g.*, species abundance, productivity, distribution) are met. Adaptive management treats project implementation as an ongoing process and incorporates information from data collection to evaluate whether or not resource objectives are being attained and why. Adaptive management is based on the premise that managed ecosystems are complex and inherently unpredictable and thus variability and flexibility are necessary to respond to changing conditions.

Breeding Area: The geographic boundary of the area where piping plovers exhibit territorial and courtship behavior, nest building, egg-laying, incubating, brooding, chick-rearing, and foraging. Examples of breeding areas include portions of foredunes, beach berm, intertidal areas, overwashed beaches, and blow outs.

Brood: Chicks hatched from a single nest and tended by one or both parents (piping plover chicks in a brood are mobile and capable of foraging for themselves within hours of hatching).

Clutch: The eggs laid in one nest.

Designated Representative: A Corps employee, contractor, or partner that is qualified to identify piping plovers and their nesting habitats and who has been authorized to act on the Corps' behalf to coordinate and monitor construction activities.

Disturbance: A sudden change in behavior of a piping plover (*e.g.*, from feeding to alert, from resting to running, from incubation to nest defense) that coincides with an event known to stimulate distress in piping plover; attribution of disturbance to human activities generally requires that no apparent natural disturbance stimuli (*e.g.*, avian predators flying overhead) are present and that the new behavior is one associated with distress (*e.g.*, running or flying away, alarm calling, chick crouching, broken wing feigning, and standing alert).

Fledged chick: Capable of flying; a chick that has been observed in level flight for more than 15 meters.

Growing Area: The geographic boundary of an area where individual or multiple seabeach amaranth plants are identified by a qualified monitor.

Harass: An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 C.F.R. § 17.3).

Harm: An act which actually kills or injures wildlife, including significant habitat modification or degradation that results in the killing or injury of wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering (50 C.F.R. § 17.3).

Monitor: Monitoring includes, but is not limited to, detecting and recording locations of seabeach amaranth plants, and breeding piping plovers, as well as locating nests, incubating adults, and broods, interpreting piping plover behaviors, and documenting behavioral observations. This activity is undertaken without causing disturbance to the birds or destruction of the plants under observation. Except to determine the number of eggs in a newly discovered nest, piping plover monitoring is done from a distance of greater than 164 ft. (50 m.) using binoculars or spotting scopes. Recommended piping plover monitoring procedures are described in detail in Goldin (1994) and Cairns (1982).

Nesting: The phase in the breeding cycle which includes the construction of nests, laying of eggs, and egg incubation. The courtship and nest building phase includes the construction of numerous unoccupied scrapes, or shallow depressions, which are formed by the male; one of which will be selected by the female for egg-laying.

Nesting Area: The entire site currently occupied by courting, territorial, incubating, or brood-rearing piping plovers, nests with eggs, unfledged chicks, or fledged chicks that have not yet left their natal area, or any site so occupied during any of the three most recent nesting seasons (including the current season if territories have already been established for the year).

Off-road Vehicle (ORV): A motorized vehicle being operated in an area that is not paved, graveled, or otherwise graded, hardened, or permanently maintained in such condition.

Predator Exclosures: Wire mesh fences, a minimum of 10 ft. (3 m.) in diameter, placed around piping plover nests to exclude mammalian and avian predators (see "Guidelines for the Use of Predator Exclosures to Protect Piping Plover Nests" found in U.S. Fish and Wildlife Service 1996a).

Qualified Biologist: A person who has the skills, knowledge, and ability to conduct monitoring (see above) for the target species. Aptitude for monitoring includes keen powers of observation, familiarity with avian and plant biology, experience observing birds or other wildlife for sustained periods, tolerance for adverse weather, patience, and the ability to maintain detailed organized notes.

Suitable Habitat: Habitat that contains natural features associated with known seabeach amaranth and / or piping plover breeding habitat and that could be reasonably expected to be occupied in the upcoming growing or nesting season or in the reasonably foreseeable future.

Symbolic Fencing: One or two strands of lightweight string, tied between posts to delineate areas where pedestrians (and their pets) and vehicles may not enter.

Take: To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (ESA, 16 U.S.C. § 1532).

Territorial Adult: A piping plover, at least 9 months old, that defends a portion of the beach against other piping plovers (except its actual or prospective mate) and other perceived intruders. Territorial behaviors vary according to the stage in the breeding cycle, and include, but are not limited to, "horizontal threat," "parallel run," and aerial displays with accompanying vocalizations; distraction behaviors such as squatting, false brooding, running, feigning injury, and alarm calling.

Unfledged: A condition of piping plover maturation when chicks are incapable of flight.

Vehicle Closures: Areas where off-road vehicles (ORVs) have been temporarily excluded to prevent take of adults, eggs, and unfledged chicks.

Warning Signs: Waterproof signs, not smaller than 8.5 in (21.6 cm.) by 11 in (28 cm.), which state at a minimum, that the area is a piping plover breeding area, or a seabeach amaranth growing area, is restricted, and that these birds and plants are protected under Federal and State laws.

Wrack: Organic material including seaweed, seashells, driftwood, and other material deposited on beaches by wave and tidal action.

Appendix B.

Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitats on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 Westgate Center Drive
Hadley, MA 01035-9589

TAKE PRIDE IN AMERICA

In Reply Refer To:
FWS/Region 5/ES-TE

APR 21 1994

Mr. John H. Spencer
Bureau of Natural Resources
Department of Environmental Protection
79 Elm Street
Hartford, Connecticut 06106-5127

Dear Mr. Spencer:

Enclosed are the U.S. Fish and Wildlife Service's Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitat on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act. This is the final version of the draft guidelines sent to you for review and comment on March 18, 1994.

These guidelines, based on the best available biological information, provide a flexible approach to protecting piping plovers, while minimizing impacts on beach recreation on non-Federal lands. Management techniques recommended in these guidelines will generally facilitate pedestrian access to the shoreline throughout the plover's breeding cycle. Recommended management options that include intensive monitoring will, in most cases, also allow use of motorized vehicles except when flightless chicks are present.

Please contact Anne Hecht at 508-443-4325 or Paul Nickerson at 413-253-8615 if you have questions about these guidelines or other aspects of the piping plover recovery effort.

Sincerely,

Ronald E. Lambertson

Regional Director

Enclosure

GUIDELINES FOR MANAGING RECREATIONAL ACTIVITIES IN PIPING PLOVER BREEDING HABITAT ON THE U.S. ATLANTIC COAST TO AVOID TAKE UNDER SECTION 9 OF THE ENDANGERED SPECIES ACT

Northeast Region, U.S. Fish and Wildlife Service
April 15, 1994

The following information is provided as guidance to beach managers and property owners seeking to avoid potential violations of Section 9 of the Endangered Species Act (16 U.S.C. 1538) and its implementing regulations (50 CFR Part 17) that could occur as the result of recreational activities on beaches used by breeding piping plovers (*Charadrius melodus*) along the Atlantic Coast. These guidelines were developed by the Northeast Region, U.S. Fish and Wildlife Service (Service), with assistance from the U.S. Atlantic Coast Piping Plover Recovery Team. The guidelines are advisory, and failure to implement them does not, of itself, constitute a violation of the law. Rather, they represent the Service's best professional advice to beach managers and landowners regarding the management options that will prevent direct mortality, harm, or harassment of piping plovers and their eggs due to recreational activities.

Some land managers have endangered species protection obligations under Section 7 of the Endangered Species Act (see section I below) or under Executive Orders 11644 and 11989[1] that go beyond adherence to these guidelines. Nothing in this document should be construed as lack of endorsement of additional piping plover protection measures implemented by these land managers or those who are voluntarily undertaking stronger plover protection measures.

This document contains four sections: (I) a brief synopsis of the legal requirements that afford protection to nesting piping plovers; (II) a brief summary of the life history of piping plovers and potential threats due to recreational activities during the breeding cycle; (III) guidelines for protecting piping plovers from recreational activities on Atlantic Coast beaches; and (IV) literature cited.

[1] Executive Order 11644, Use of Off-Road Vehicles on the Public Lands and Executive Order 11989, Off-Road Vehicles on Public Lands pertain to lands under custody of the Secretaries of Agriculture, Defense, and Interior (except for Indian lands) and certain lands under the custody of the Tennessee Valley Authority.

I. LEGAL CONSIDERATIONS

Section 9 of the Endangered Species Act (ESA) prohibits any person subject to the jurisdiction of the United States from harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting listed wildlife species. It is also unlawful to attempt such acts, solicit another to commit such acts, or cause such acts to be committed. A "person" is defined in Section 3 to mean "an individual, corporation, partnership, trust, association, or any other private entity; or any officer, employee, agent, department, or instrumentality of the Federal Government, of any State, municipality, or political subdivision of a State, or of any foreign government; any State, municipality, or political subdivision of a State; or any other entity subject to the jurisdiction of the United States." Regulations implementing the ESA (50 CFR 17.3) further define "harm" to include significant habitat modification or degradation that results in the killing or injury of wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. "Harass" means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Penalties for violations of Section 9 are provided in Section 11 of the ESA; for threatened species, these penalties include fines of up to $25,000, imprisonment for not more than six months, or both.

Section 10 of the ESA and related regulations provide for permits that may be granted to authorize acts prohibited under Section 9, for scientific purposes or to enhance the propagation or survival of a listed species. States that have Cooperative Agreements under Section 6 of the ESA, may provide written authorization for take that occurs in the course of implementing conservation programs. For example, State agencies have authorized certain biologists to construct predator exclosures for piping plovers. It is also legal for employees or designated agents of certain Federal or State agencies to take listed species without a permit, if the action is necessary to aid sick, injured, or orphaned animals or to salvage or dispose of a dead specimen.

Section 10 also allows permits to be issued for take that is "incidental to, and not the purpose of, carrying out an otherwise lawful activity" if the Service determines that certain conditions have been met. An applicant for an incidental take permit must prepare a conservation plan that specifies the impacts of the take, steps the applicant will take to minimize and mitigate the impacts, funding that will be available to implement these steps, alternative actions to the take

that the applicant considered, and the reasons why such alternatives are not being utilized.

Section 7 of the ESA may be pertinent to beach managers and landowners in situations that have a Federal nexus. Section 7 requires Federal agencies to consult with the Service (or National Marine Fisheries Service for marine species) prior to authorizing, funding, or carrying out activities that may affect listed species. Section 7 also requires that these agencies use their authorities to further the conservation of listed species. Section 7 obligations have caused Federal land management agencies to implement piping plover protection measures that go beyond those required to avoid take, for example by conducting research on threats to piping plovers. Other examples of Federal activities that may affect piping plovers along the Atlantic Coast, thereby triggering Section 7 consultation, include permits for beach nourishment or disposal of dredged material (U.S. Army Corps of Engineers) and funding of beach restoration projects (Federal Emergency Management Authority).

Piping plovers, as well as other migratory birds such as least terns, common terns, American oystercatchers, laughing gulls, herring gulls, and great black-blacked gulls, their nests, and eggs are also protected under the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712). Prohibited acts include pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting such conduct. Violators may be fined up to $5000 and/or imprisoned for up to six months.

Almost all States within the breeding range of the Atlantic Coast piping plover population list the species as State threatened or endangered (Northeast Nongame Technical Committee 1993). Various laws and regulations may protect State-listed species from take, but the Service has not ascertained the adequacy of the guidelines presented in this document to meet the requirements of any State law.

II. LIFE HISTORY AND THREATS FROM HUMAN DISTURBANCE

Piping plovers are small, sand-colored shorebirds that nest on sandy, coastal beaches from South Carolina to Newfoundland. Since 1986, the Atlantic Coast population has been protected as a threatened species under provisions of the U.S. Endangered Species Act of 1973 (U.S. Fish and Wildlife Service 1985). The U.S. portion of the population was estimated at 875 pairs in 1993 (U.S. Fish and

Wildlife Service 1993). Many characteristics of piping plovers contribute to their susceptibility to take due to human beach activities.

LIFE HISTORY

Piping plovers begin returning to their Atlantic Coast nesting beaches in mid-March (Coutu et al. 1990, Cross 1990, Goldin 1990, MacIvor 1990, Hake 1993). Males establish and defend territories and court females (Cairns 1982). Eggs may be present on the beach from mid-April through late July. Clutch size is generally four eggs, and the incubation period[2] usually lasts for 27-28 days. Piping plovers fledge only a single brood per season, but may renest several times if previous nests are lost. Chicks are precocial[3] (Wilcox 1959, Cairns 1982). They may move hundreds of yards from the nest site during their first week of life (see Table 1, Summary of Chick Mobility Data). Chicks remain together with one or both parents until they fledge (are able to fly) at 25 to 35 days of age. Depending on date of hatching, flightless chicks may be present from mid-May until late August, although most fledge by the end of July (Patterson 1988, Goldin 1990, MacIvor 1990, Howard et al. 1993).

Piping plover nests are situated above the high tide line on coastal beaches, sand flats at the ends of sandspits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, and washover areas cut into or between dunes. They may also nest on areas where suitable dredge material has been deposited. Nest sites are shallow scraped depressions in substrates ranging from fine grained sand to mixtures of sand and pebbles, shells or cobble (Bent 1929, Burger 1987a, Cairns 1982, Patterson 1988, Flemming et al. 1990, MacIvor 1990, Strauss 1990). Nests are usually found in areas with little or no vegetation although, on occasion, piping plovers will nest under stands of American beachgrass (*Ammophila breviligulata*) or other vegetation (Patterson 1988, Flemming et al. 1990, MacIvor 1990). Plover nests may be very difficult to detect, especially during the 6-7 day egg-laying phase when the birds generally do not incubate (Goldin 1994).

Plover foods consist of invertebrates such as marine worms, fly larvae, beetles, crustaceans or mollusks (Bent 1929, Cairns 1977, Nicholls 1989). Feeding areas include intertidal portions of ocean beaches, washover areas, mudflats,

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[2] "Incubation" refers to adult birds sitting on eggs, to maintain them at a favorable temperature for embryo development.

[3] "Precocial" birds are mobile and capable of foraging for themselves within several hours of hatching.

sandflats, wrack lines[4], and shorelines of coastal ponds, lagoons or salt marshes (Gibbs 1986, Coutu et al. 1990, Hoopes et al. 1992, Loegering 1992, Goldin 1993). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986, Coutu et al. 1990, McConnaughey et al. 1990, Loegering 1992, Goldin 1993, Hoopes 1993) and by stage in the breeding cycle (Cross 1990). Adults and chicks on a given site may use different feeding habitats in varying proportion (Goldin et al. 1990). Feeding activities of chicks may be particularly important to their survival. Cairns (1977) found that piping plover chicks typically tripled their weight during the first two weeks post-hatching; chicks that failed to achieve at least 60% of this weight gain by day 12 were unlikely to survive. During courtship, nesting, and brood rearing, feeding territories are generally contiguous to nesting territories (Cairns 1977), although instances where brood-rearing areas are widely separated from nesting territories are not uncommon (see Table 1). Feeding activities of both adults and chicks may occur during all hours of the day and night (Burger 1993) and at all stages in the tidal cycle (Goldin 1993, Hoopes 1993).

THREATS FROM NONMOTORIZED BEACH ACTIVITIES

Sandy beaches that provide nesting habitat for piping plovers are also attractive recreational habitats for people and their pets. Nonmotorized recreational activities can be a source of both direct mortality and harassment of piping plovers. Pedestrians on beaches may crush eggs (Burger 1987b, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Unleashed dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980).

Pedestrians may flush incubating plovers from nests (see Table 2, Summary of Data on Distances at Which Plovers React to Disturbance), exposing eggs to avian predators or causing excessive cooling or heating of eggs. Repeated exposure of shorebird eggs on hot days may cause overheating, killing the embryos (Bergstrom 1991). Excessive cooling may kill embryos or retard their development, delaying hatching dates (Welty 1982). Pedestrians can also displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993). Fireworks are highly disturbing to piping plovers (Howard et al. 1993). Plovers are particularly intolerant of kites, compared with

[4] Wrack is organic material including seaweed, seashells, driftwood and other materials deposited on beaches by tidal action.

pedestrians, dogs, and vehicles; biologists believe this may be because plovers perceive kites as potential avian predators (Hoopes et al. 1992).

THREATS FROM MOTOR VEHICLES

Unrestricted use of motorized vehicles on beaches is a serious threat to piping plovers and their habitats. Vehicles can crush eggs (Wilcox 1959; Tull 1984; Burger 1987b; Patterson et al. 1991; United States of America v. Breezy Point Cooperative, Inc., U.S. District Court, Eastern District of New York, Civil Action No. CV-90-2542, 1991; Shaffer and Laporte 1992), adults, and chicks. In Massachusetts and New York, biologists documented 14 incidents in which 18 chicks and 2 adults were killed by vehicles between 1989 and 1993 (Melvin et al. 1994). Goldin (1993) compiled records of 34 chick mortalities (30 on the Atlantic Coast and 4 on the Northern Great Plains) due to vehicles. Many biologists that monitor and manage piping plovers believe that many more chicks are killed by vehicles than are found and reported (Melvin et al. 1994). Beaches used by vehicles during nesting and brood-rearing periods generally have fewer breeding plovers than available nesting and feeding habitat can support. In contrast, plover abundance and productivity has increased on beaches where vehicle restrictions during chick-rearing periods have been combined with protection of nests from predators (Goldin 1993; S. Melvin, pers. comm., 1993).

Typical behaviors of piping plover chicks increase their vulnerability to vehicles. Chicks frequently move between the upper berm or foredune and feeding habitats in the wrack line and intertidal zone. These movements place chicks in the paths of vehicles driving along the berm or through the intertidal zone. Chicks stand in, walk, and run along tire ruts, and sometimes have difficulty crossing deep ruts or climbing out of them (Eddings et al. 1990, Strauss 1990, Howard et al. 1993). Chicks sometimes stand motionless or crouch as vehicles pass by, or do not move quickly enough to get out of the way (Tull 1984, Hoopes et al. 1992, Goldin 1993). Wire fencing placed around nests to deter predators (Rimmer and Deblinger 1990, Melvin et al. 1992) is ineffective in protecting chicks from vehicles because chicks typically leave the nest within a day after hatching and move extensively along the beach to feed (see Table 1).

Vehicles may also significantly degrade piping plover habitat or disrupt normal behavior patterns. They may harm or harass plovers by crushing wrack into the sand and making it unavailable as cover or a foraging substrate, by creating ruts that may trap or impede movements of chicks, and by preventing plovers from

using habitat that is otherwise suitable (MacIvor 1990, Strauss 1990, Hoopes et al. 1992, Goldin 1993).

III. GUIDELINES FOR PROTECTING PIPING PLOVERS FROM RECREATIONAL DISTURBANCE

The Service recommends the following protection measures to prevent direct mortality or harassment of piping plovers, their eggs, and chicks.

MANAGEMENT OF NONMOTORIZED RECREATIONAL USES

On beaches where pedestrians, joggers, sun-bathers, picnickers, fishermen, boaters, horseback riders, or other recreational users are present in numbers that could harm or disturb incubating plovers, their eggs, or chicks, areas of at least 50 meter-radius around nests above the high tide line should be delineated with warning signs and symbolic fencing[5]. Only persons engaged in rare species monitoring, management, or research activities should enter posted areas. These areas should remain fenced as long as viable eggs or unfledged chicks are present. Fencing is intended to prevent accidental crushing of nests and repeated flushing of incubating adults, and to provide an area where chicks can rest and seek shelter when large numbers of people are on the beach.

Available data indicate that a 50 meter buffer distance around nests will be adequate to prevent harassment of the majority of incubating piping plovers. However, fencing around nests should be expanded in cases where the standard 50 meter-radius is inadequate to protect incubating adults or unfledged chicks from harm or disturbance. Data from various sites distributed across the plover's Atlantic Coast range indicates that larger buffers may be needed in some locations (see Table 2). This may include situations where plovers are especially intolerant of human presence, or where a 50 meter-radius area provides insufficient escape cover or alternative foraging opportunities for plover chicks.[6]

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[5] "Symbolic fencing" refers to one or two strands of light-weight string, tied between posts to delineate areas where pedestrians and vehicles should not enter.

[6] For example, on the basis of data from an intensive three year study that showed that plovers on Assateague Island in Maryland flush from nests at greater distances than those elsewhere (Loegering 1992), the Assateague Island National Seashore established 200 meter buffers zones around most nest sites and primary foraging areas (Assateague Island National Seashore 1993). Following a precipitous drop in numbers of nesting plover pairs in Delaware in the late 1980's, that State adopted a Piping Plover Management Plan that provided 100 yard buffers around nests on State park lands and included intertidal areas (Delaware Department of Natural Resources and Environmental Control 1990).

In cases where the nest is located less than 50 meters above the high tide line, fencing should be situated at the high tide line, and a qualified biologist should monitor responses of the birds to passersby, documenting his/her observations in clearly recorded field notes. Providing that birds are not exhibiting signs of disturbance, this smaller buffer may be maintained in such cases.

On portions of beaches that receive heavy human use, areas where territorial plovers are observed should be symbolically fenced to prevent disruption of territorial displays and courtship. Since nests can be difficult to locate, especially during egg-laying, this will also prevent accidental crushing of undetected nests. If nests are discovered outside fenced areas, fencing should be extended to create a sufficient buffer to prevent disturbance to incubating adults, eggs, or unfledged chicks.

Pets should be leashed and under control of their owners at all times from April 1 to August 31 on beaches where piping plovers are present or have traditionally nested. Pets should be prohibited on these beaches from April 1 through August 31 if, based on observations and experience, pet owners fail to keep pets leashed and under control.

Kite flying should be prohibited within 200 meters of nesting or territorial adult or unfledged juvenile piping plovers between April 1 and August 31.

Fireworks should be prohibited on beaches where plovers nest from April 1 until all chicks are fledged.

MOTOR VEHICLE MANAGEMENT

The Service recommends the following minimum protection measures to prevent direct mortality or harassment of piping plovers, their eggs, and chicks on beaches where vehicles are permitted. Since restrictions to protect unfledged chicks often impede vehicle access along a barrier spit, a number of management options affecting the timing and size of vehicle closures are presented here. Some of these options are contingent on implementation of intensive plover monitoring and management plans by qualified biologists. It is recommended that landowners seek concurrence with such monitoring plans from either the Service or the State wildlife agency.

Protection of Nests

All suitable piping plover nesting habitat should be identified by a qualified biologist and delineated with posts and warning signs or symbolic fencing on or before April 1 each year. All vehicular access into or through posted nesting habitat should be prohibited. However, prior to hatching, vehicles may pass by such areas along designated vehicle corridors established along the outside edge of plover nesting habitat. Vehicles may also park outside delineated nesting habitat, if beach width and configuration and tidal conditions allow. Vehicle corridors or parking areas should be moved, constricted, or temporarily closed if territorial, courting, or nesting plovers are disturbed by passing or parked vehicles, or if disturbance is anticipated because of unusual tides or expected increases in vehicle use during weekends, holidays, or special events.

If data from several years of plover monitoring suggests that significantly more habitat is available than the local plover population can occupy, some suitable habitat may be left unposted if the following conditions are met:

1. The Service OR a State wildlife agency that is party to an agreement under Section 6 of the ESA provides written concurrence with a plan that:

A. Estimates the number of pairs likely to nest on the site based on the past monitoring and regional population trends.

AND

B. Delineates the habitat that will be posted or fenced prior to April 1 to assure a high probability that territorial plovers will select protected areas in which to court and nest. Sites where nesting or courting plovers were observed during the last three seasons as well as other habitat deemed most likely to be pioneered by plovers should be included in the posted and/or fenced area.

AND

C. Provides for monitoring of piping plovers on the beach by a qualified biologist(s). Generally, the frequency of monitoring should be not less than twice per week prior to May 1 and not less than three times per week thereafter. Monitoring should occur daily whenever moderate to large numbers of vehicles are on the beach.

Monitors should document locations of territorial or courting plovers, nest locations, and observations of any reactions of incubating birds to pedestrian or vehicular disturbance.

AND

2. All unposted sites are posted immediately upon detection of territorial plovers.

Protection of Chicks

Sections of beaches where unfledged piping plover chicks are present should be temporarily closed to all vehicles not deemed essential. (See the provisions for essential vehicles below.) Areas where vehicles are prohibited should include all dune, beach, and intertidal habitat within the chicks' foraging range, to be determined by either of the following methods:

1. The vehicle free area should extend 1000 meters on each side of a line drawn through the nest site and perpendicular to the long axis of the beach. The resulting 2000 meter-wide area of protected habitat for plover chicks should extend from the ocean-side low water line to the bay-side low water line or to the farthest extent of dune habitat if no bay-side intertidal habitat exists. However, vehicles may be allowed to pass through portions of the protected area that are considered inaccessible to plover chicks because of steep topography, dense vegetation, or other naturally-occurring obstacles.

OR

2. The Service OR a State wildlife agency that is party to an agreement under Section 6 of the ESA provides written concurrence with a plan that:

A. Provides for monitoring of all broods during the chick-rearing phase of the breeding season and specifies the frequency of monitoring.

AND

B. Specifies the minimum size of vehicle-free areas to be established in the vicinity of unfledged broods based on the mobility

of broods observed on the site in past years and on the frequency of monitoring. Unless substantial data from past years show that broods on a site stay very close to their nest locations, vehicle-free areas should extend at least 200 meters on each side of the nest site during the first week following hatching. The size and location of the protected area should be adjusted in response to the observed mobility of the brood, but in no case should it be reduced to less than 100 meters on each side of the brood. In some cases, highly mobile broods may require protected areas up to 1000 meters, even where they are intensively monitored. Protected areas should extend from the ocean-side low water line to the bay-side low water line or to the farthest extent of dune habitat if no bay-side intertidal habitat exists. However, vehicles may be allowed to pass through portions of the protected area that are considered inaccessible to plover chicks because of steep topography, dense vegetation, or other naturally-occurring obstacles. In a few cases, where several years of data documents that piping plovers on a particular site feed in only certain habitat types, the Service or the State wildlife management agency may provide written concurrence that vehicles pose no danger to plovers in other specified habitats on that site.

Timing of Vehicle Restrictions in Chick Habitat

Restrictions on use of vehicles in areas where unfledged plover chicks are present should begin on or before the date that hatching begins and continue until chicks have fledged. For purposes of vehicle management, plover chicks are considered fledged at 35 days of age or when observed in sustained flight for at least 15 meters, whichever occurs first.

When piping plover nests are found before the last egg is laid, restrictions on vehicles should begin on the 26th day after the last egg is laid. This assumes an average incubation period of 27 days, and provides a 1 day margin of error.

When plover nests are found after the last egg has been laid, making it impossible to predict hatch date, restrictions on vehicles should begin on a date determined by one of the following scenarios:

1) With intensive monitoring: If the nest is monitored at least twice per day, at dawn and dusk (before 0600 hrs and after 1900 hrs) by a qualified

biologist, vehicle use may continue until hatching begins. Nests should be monitored at dawn and dusk to minimize the time that hatching may go undetected if it occurs after dark. Whenever possible, nests should be monitored from a distance with spotting scope or binoculars to minimize disturbance to incubating plovers.

OR

2) Without intensive monitoring: Restrictions should begin on May 15 (the earliest probable hatch date). If the nest is discovered after May 15, then restrictions should start immediately.

If hatching occurs earlier than expected, or chicks are discovered from an unreported nest, restrictions on vehicles should begin immediately.

If ruts are present that are deep enough to restrict movements of plover chicks, then restrictions on vehicles should begin at least 5 days prior to the anticipated hatching date of plover nests. If a plover nest is found with a complete clutch, precluding estimation of hatching date, and deep ruts have been created that could reasonably be expected to impede chick movements, then restrictions on vehicles should begin immediately.

Essential Vehicles

Because it is impossible to completely eliminate the possibility that a vehicle will accidently crush an unfledged plover chicks, use of vehicles in the vicinity of broods should be avoided whenever possible. However, the Service recognizes that life-threatening situations on the beach may require emergency vehicle response. Furthermore, some "essential vehicles" may be required to provide for safety of pedestrian recreationists, law enforcement, maintenance of public property, or access to private dwellings not otherwise accessible. On large beaches, maintaining the frequency of plover monitoring required to minimize the size and duration of vehicle closures may necessitate the use of vehicles by plover monitors.

Essential vehicles should only travel on sections of beaches where unfledged plover chicks are present if such travel is absolutely necessary and no other reasonable travel routes are available. All steps should be taken to minimize number of trips by essential vehicles through chick habitat areas. Homeowners

should consider other means of access, eg. by foot, water, or shuttle services, during periods when chicks are present.

The following procedures should be followed to minimize the probability that chicks will be crushed by essential (non-emergency) vehicles:

1. Essential vehicles should travel through chick habitat areas only during daylight hours, and should be guided by a qualified monitor who has first determined the location of all unfledged plover chicks.

2. Speed of vehicles should not exceed five miles per hour.

3. Use of open 4-wheel motorized all-terrain vehicles (ATVs) or non-motorized all-terrain bicycles is recommended whenever possible for monitoring and law enforcement because of the improved visibility afforded operators.

4. A log should be maintained by the beach manager of the date, time, vehicle number and operator, and purpose of each trip through areas where unfledged chicks are present. Personnel monitoring plovers should maintain and regularly update a log of the numbers and locations of unfledged plover chicks on each beach. Drivers of essential vehicles should review the log each day to determine the most recent number and location of unfledged chicks.

Essential vehicles should avoid driving on the wrack line, and travel should be infrequent enough to avoid creating deep ruts that could impede chick movements. If essential vehicles are creating ruts that could impede chick movements, use of essential vehicles should be further reduced and, if necessary, restricted to emergency vehicles only.

SITE-SPECIFIC MANAGEMENT GUIDANCE

The guidelines provided in this document are based on an extensive review of the scientific literature and are intended to cover the vast majority of situations likely to be encountered on piping plover nesting sites along the U.S. Atlantic Coast. However, the Service recognizes that site-specific conditions may lead to anomalous situations in which departures from this guidance may be safely implemented. The Service recommends that landowners who believe such situations exist on their lands contact either the Service or the State wildlife

agency and, if appropriate, arrange for an on-site review. Written documentation of agreements regarding departures from this guidance is recommended.

In some unusual circumstances, Service or State biologists may recognize situations where this guidance provides insufficient protection for piping plovers or their nests. In such a case, the Service or the State wildlife agency may provide written notice to the landowner describing additional measures recommended to prevent take of piping plovers on that site.

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Table 1. Summary of Chick Mobility Data

Source	Location	Data
Patterson 1988 (p.40)	Maryland and Virginia	18 of 38 broods moved to feeding areas more than 100 meters from their nests; 5 broods moved more than 600 meters (distance measured parallel to wrackline).
Cross 1989 (p.23)	Virginia	At three sites, observers relocated broods at mean distances from their nests of 153 m +/- 97m (44 observations, 14 broods), 32 m +/-7 m (8 observations, 3 broods), and 492 m +/- 281 m (12 observations, 4 broods).
Coutu et al. 1990 (p.12)	North Carolina	Observations of 11 broods averaged 212 m from their nests; 3 broods moved 400-725 m from nest sites.
Strauss 1990 (p.33)	Massachusetts	10 chicks moved more than 200 m during first 5 days post-hatch while 19 chicks moved less than 200 meters during same interval.
Loegering 1992 (p.72)	Maryland	Distances broods moved from nests during first 5 days post-hatch averaged 195 m in Bay habitat (n=10), 141 m in Interior habitat (n=36), and 131 m in Ocean habitat (n=41). By 21 days, average movement in each habitat had, respectively, increased to 850 m (n=1), 464 m (n=10), and 187 m (n=69). One brood moved more than 1000 m from its nest.
Melvin et al. 1994	Massachusetts and New York	In 14 incidents in which 18 chicks were killed by vehicles, chicks were run over $\leq$ 10 m to $\leq$ 900 m from their nests. In 7 of these instances, mortality occurred $\geq$ 200 m from the nest.

Table 2. Summary of Data on Distances at which Piping Plovers React to Disturbance

Source	Location	Data
Flushing of Incubating Birds by Pedestrians		
Flemming et al. 1988 (p.326)	Nova Scotia	Adults usually flushed from the nests at distances <40 m; however, great variation existed and reaction distances as great as 210 m were observed.
Cross 1990 (p.47)	Virginia	Mean flushing distances in each of two years were 47 m (n=181, range = 5 m to 300 m) and 25 m (n=214, range = 2 m to 100 m).
Loegering 1992 (p.61)	Maryland	Flushing distances averaged 78 m (n=43); range was 20 m to 174 m. Recommended use of 225 m disturbance buffers on his site.
Cross and Terwilliger 1993	Virginia	Mean flushing distance for all years on all sites (Virginia plover sites, 1986-91) was 63 m (n=201, SD=31, range = 7 m to 200 m). Differences among years were not significant, but differences among sites were.
Hoopes 1993 (p.72)	Massachusetts	Mean flushing distance for incubating plovers was 24 m (n=31).
Disturbance to Non-incubating Birds		
Hoopes 1993 (p.89)	Massachusetts	Mean response distance (all ages, all behaviors) was 23 m for pedestrian disturbances (range = 10 m to 60 m), 40 m for vehicles (range = 30 m to 70 m), 46 m for dogs/pets (range = 20 m to 100 m), and 85 m for kites (range = 60 m to 120 m).
Goldin 1993b (p.74)	New York	Average flushing distance for adult and juvenile plovers was 18.7 m for pedestrian disturbances (n=585), 19.5 m for joggers (n=183), and 20.4 m for vehicles (n=111). Pedestrians caused chicks to flush at an average distance of 20.7 m (n=175), joggers at 32.3 m (n=37), and vehicles at 19.3 m (n=7). Tolerance of individual birds varied; one chick moved 260 m in direct response to 20 disturbances in 1 hour.

Appendix C.

2003 New Jersey Endangered Beach Nesting Bird (Piping Plover, Least Tern and Black Skimmer) Site Management Report

2003 New Jersey Endangered Beach Nesting Bird (Piping Plover, Least Tern and Black Skimmer) Site Management Report

Prepared By
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New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Endangered and Nongame Species Program

Introduction

This report provides a site-by-site summary of monitoring and management efforts undertaken in New Jersey in 2003 for the protection of piping plovers, least terns and black skimmers at all coastal nesting sites. The report is compiled and edited by the New Jersey Division of Fish and Wildlife (NJDFW) - Endangered and Nongame Species Program. NJDFW is responsible for management at all municipal beaches and state-owned Parks or Natural Areas, as well as one U.S. Coast Guard facility (TRACEN) and one county park (Seven Presidents Oceanfront Park). Information for other nesting sites was provided to NJDFW by the site managers responsible for the management at those sites. This includes the National Park Service, Gateway National Recreation Area for Sandy Hook; the U.S. Fish and Wildlife Service, Forsythe National Wildlife Refuge for Holgate and Little Beach; the U.S. Fish and Wildlife Service, Cape May Wildlife Refuge for U.S. Coast Guard – LSU; and The Nature Conservancy, Delaware Bayshores Office for portions of the Cape May Meadows.

This report is organized on a site-by-site basis, geographically from north to south. Topics addressed for each site include: *Monitoring and Patrolling, Fencing/Posting, Predator Exclosures, Predator Control, Beach Management, Coordination/Communication, Beach Nesting Bird Management Plan* and *Outreach*. Where necessary, additional topics are covered under specific headings or *Other*.

The **Management** heading discusses current (2003) monitoring and management practices relevant to each management topic, while the **Recommendations** heading presents a discussion of recommended changes to these policies and practices as suggested by the site manager. A brief summary of nesting results is included under the heading **Nesting Results**.

A table summarizing the species present, the agency responsible for management and the management techniques used at each site is provided at the beginning of this report. In addition, a map showing the location of 2003 nesting sites is also provided.

Additional copies of this report, as well as other reports and information regarding endangered beach nesting birds in New Jersey are available online at www.njfishandwildlife.com or by request at:

New Jersey Division of Fish and Wildlife
Endangered and Nongame Species Program
2201 Route 631
Woodbine, NJ 08087

Glossary of Acronyms and Abbreviations

ATV	All-Terrain Vehicle
BNB	Beach Nesting Bird(s)
BP	Beach Patrol (Lifeguards)
CCRP	Coastal Conservation Research Program
CDF	Contained Disposal Facility
ENSP	Endangered and Nongame Species Program
LSU	Loran Support Unit
MBCC	Monmouth Beach Cultural Center
MU	Monmouth University
NA	Natural Area (State of New Jersey designation)
NGTC	National Guard Training Center
NJDEP	New Jersey Department of Environmental Protection
NJDFW	New Jersey Division of Fish and Wildlife
NJDPF	New Jersey Division of Parks and Forestry
NJFO	New Jersey Field Office
NJONLM	New Jersey Office of Natural Lands Management
NPS	National Park Service
NRA	National Recreation Area
NWR	National Wildlife Refuge
ORV	Off-Road Vehicle
PD	Police Department
PWD	Public Works Department
SCA	Student Conservation Association
TNC	The Nature Conservancy
TRACEN	Training Center (United States Coast Guard)
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
WCC	Wildlife Conservation Corp. (NJDFW volunteer)

Summary of beach nesting bird site management in New Jersey: 2003.

Site	Species Present[a]	Signed	Pre Fence	String & Post Fence	Partial Snow Fence	Wire Fence	Weekend Patrol[b]	Full-time Patrol	Predator Exclosure	Notes
Sandy Hook Coast Guard	PP,LT	X	X	X	X		V,P	V,P	X	
Sandy Hook North Beach	PP,LT	X	X	X	X	X	V,P	V,P	X	1
Sandy Hook N. Gunnison	PP,LT	X	X	X	X	X	V,P	V,P	X	1
Sandy Hook S. Gunnison	PP	X	X	X	X		V,P	V,P		1
Sandy Hook Critical Zone	PP,LT	X		X	X	X	V,P	V,P	X	1
Sandy Hook Hidden Beach	PP,LT	X	X	X	X	X	V,P	V,P	X	1
Sandy Hook Fee Beach	PP,LT	X	X	X	X	X	V,P	V,P	X	1
Sandy Hook South Fee Beach	PP,LT	X		X	X		V,P	V,P		1
Sea Bright North	PP,LT	X	X	X	X		I,P	I,P	X	
Monmouth Beach North	PP,LT	X	X	X	X		I,P	I,P	X	
Monmouth Beach South	PP	X	X	X			I,P	I,P		
Seven Presidents Park	PP,LT	X	X	X			I,P	I,P	X	2
Long Branch	PP,LT	X	X	X			I,P	I,P	X	3
Belmar – Shark River Inlet	LT	X	X	X			I,P	I,P		
Sea Girt – Wreck Pond	PP,LT	X	X	X			I,P	I,P	X	
Sea Girt – NGTC	LT	X	X	X			I,P	I,P		
Island Beach SP - Dike	PP,LT,BS	X	X	X	X	X	P	P	X	4
Barnegat Light	PP,LT	X	X	X		X	V,P	P	X	
Holgate	PP,LT,BS	X					V,P	V,P	X	5
Little Beach	PP	X					P	P		6
North Brigantine NA	PP	X	X	X			V,P	P	*X	7
Ocean City - North	PP,LT	X		X			I,P	P		
Ocean City - Center	PP,LT	X		X	X		I,P	P		
Corson's Inlet SP	PP	X	X	X			I,P	P	*X	
Strathmere NA	BS	X		X			P	P		
Strathmere Bay Island	BS	X								
Strathmere – Upper Twp.	PP	X		X	X		P	P	X	
Townsend's Inlet	PP,LT	X	X	X	X		P	P	X	
Avalon - Dunes	PP,LT	X	X	X			I,P	I,P	X	
Stone Harbor Point	PP,LT,BS	X	X	X	X		P	P	X	
N Wildwood - Hereford Inlet	PP,LT	X	X	X			P	P		
Coast Guard - LSU	PP,LT	X	X	X			P	P		
Coast Guard -TRACEN	PP	X	X	X			V,P	P	X	8
Cape May City	LT	X		X			P	P		
Cape May Meadows – TNC	PP,LT	X	X	X			V,P	V,P	X	
Cape May Meadows - CMPSP	PP,LT	X		X			P	P	X	9

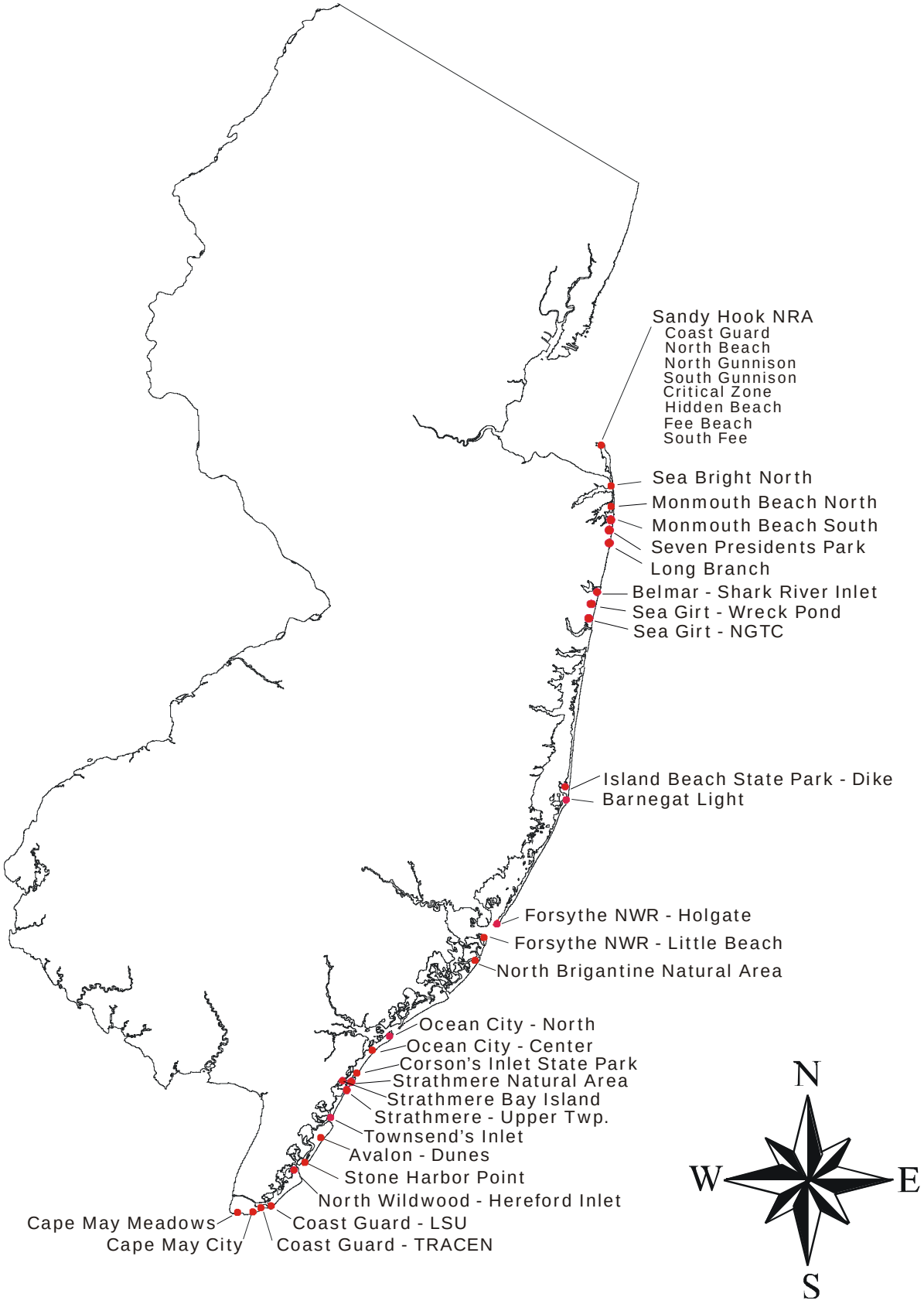
Sites in ***bold italics*** managed by agencies other than New Jersey Division of Fish and Wildlife – Endangered and Nongame Species Program. National Park Service manages Sandy Hook, USFWS Edwin B. Forsythe NWR manages Holgate and Little Beach, USFWS Cape May NWR manages Coast Guard – LSU, and The Nature Conservancy manages Cape May Meadows – TNC.

[a] Species Key: PP = Piping Plover, LT = Least Tern, BS = Black Skimmer
[b] I = Intern, P = Paid , V = Volunteer
* = Electric fenced used in conjunction with predator exclosure

Notes

1. Intertidal zone closed to public access during period of chick rearing.
2. Site co-managed with Monmouth County Park System.
3. Protected nesting area "created" by placement of chain link fence on beach for construction project.
4. Portion of site "permanently" fenced with snow fence and wire fence by NJ Division of Parks and Forestry
5. Beach closed to public during nesting season.
6. Beach only accessible by boat; closed to public year-round.
7. Beach closed to ORV traffic during period of chick rearing; northern portion also closed during egg laying/incubation period.
8. Beach closed to public and base personnel; co-managed with US Coast Guard personnel.
9. Site co-managed with The Nature Conservancy.

New Jersey Beach Nesting Bird Sites: 2003



Sandy Hook – Coast Guard

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 7 days a week by NPS staff, SCA staff and volunteers.

Fencing/Posting: NPS staff prefenced using string-and-post symbolic fence. Signs were placed every 50'. Snow fence was placed on the south end to divert visitors to the waters' edge. The intertidal zone was not closed because it was not NPS property. However, the intermittent pond behind the dunes helped offset the need for the chicks to forage at the intertidal zone.

Predator exclosures: Predator exclosures were used on each nest. Exclosures were used in this area because gulls were the top predator. There was an incident where humans lifted an exclosure and the eggs were discovered missing. This nest had both fox tracks and human tracks inside so it was unclear which was responsible. It is possible that humans lifted the exclosure making it easy for the fox to prey on the eggs. Exclosures that were not depredated by fox were fortified with wire hardware cloth covered with sand. After making the exclosures fox proof, there were still problems with abandonment.

Predator control: None undertaken.

Beach management: NPS does not mechanically rake this beach. There is an annual beach clean up sponsored by the New Jersey Clean Shores Program from mid March-April 7. There was heavy use of the intertidal zone by fisherman in front of nesting area. There was also heavy use of 4x4 vehicles by USCG to patrol the shoreline with the Navy for ships coming in and out of port.

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He was forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRA Sandy Hook Unit has a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: Beach nesting brochures were placed at the visitor center and ranger station for beach goers. Junior ranger programs were conducted weekly at North Beach to educate children about endangered species that breed on Sandy Hook.

Nesting Results

Eight (8) pairs of piping plovers nested at this site, resulting in 10 nesting attempts. A total of 40 eggs were laid, 19 eggs hatched and 13 chicks fledged.

A least tern colony (95 maximum adults) was present at the site, although only a small number of nests (12) were observed. Productivity was low (< 0.5 fledges per pair).

Recommendations

Monitoring and patrolling: Increase staffing levels to monitor area on weekends to insure compliance.

Fencing/Posting: Keep "No Pets on Beach" signs up year-round to educate the public that there are no dogs between March 15-Labor Day. Put cattle fence up between multi-use path and shorebird nesting area.

Predator exclosures: Monitor predators closely and consider using predator exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use.

Predator control: Have law enforcement (NPS) issue more violations for pets off their leashes.

Beach management: Reduce use of vehicles by NPS law enforcement after nests hatch. Place dumpsters in parking lots away from the beach from May-August at areas B, C, D, G, and North Beach. Excessive trash is being left behind by visitors and is attracting predators like fox, gulls, and crows because the park has an ineffective carry-in carry-out policy.

Coordination/Communication: Increase number of radios for staff to communicate with dispatch when violations occur.

Beach nesting bird management plan: Update management plan.

Outreach: No change.

Other: Continue SCA partnership. Increase staff by 1 more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonals, and 4 SCA's. This will allow for 1 staff member at each nesting site.

Sandy Hook – North Beach

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 7 days a week by NPS staff, SCA staff and volunteers.

Fencing/posting: NPS staff prefenced using string-and-post symbolic fence. Signs were placed every 50'. White PVC pipe was used to close the intertidal zone with signs in the shape of a stop sign stating: "Area Closed. No One Beyond This Point. No walking, swimming, fishing, kite flying, vehicles or dogs allowed".

Predator exclosures: Predator exclosures were used on each nest until fox predation became a problem. The exclosures were then fortified with wire hardware cloth covered with sand. After limited success, use of exclosures was discontinued at this site.

Predator control: None undertaken.

Beach management: NPS mechanically rakes the south end of this beach. There is an annual beach clean up sponsored by the New Jersey Shores Program from mid March-April 7.

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRA Sandy Hook Unit does have a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: BNB brochures were placed at the visitor center and ranger station for beach goers. Junior ranger programs were conducted weekly at North Beach to educate children about endangered species that breed on Sandy Hook. Once chicks hatched and the intertidal zone was closed, staff was stationed at the intertidal zone to educate visitors about Sandy Hook's endangered species.

Nesting Results

Nine (9) pairs of piping plovers nested at this site, resulting in 18 nesting attempts. A total of 63 eggs were laid, 17 eggs hatched and 11 chicks fledged.

A least tern colony (74 maximum adults) was present at the site, although only 2 nests were observed. No chicks fledged. The colony failure was due to fox predation and flooding.

Recommendations

Monitoring and patrolling: Continue to monitor bayside beaches where adults often feed. Increase staffing levels to guard intertidal zone area on weekends to insure compliance.

Fencing/Posting: Keep "No Pets on Beach" signs up year-round to educate the public that there are no dogs between March 15-Labor Day.

Predator exclosures: Monitor predators closely and consider using predator exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use.

Predator control: Have law enforcement issue more violations for pets off their leashes.

Beach management: Reduce vehicle use by law enforcement after nests hatch. Place dumpsters in parking lots away from the beach from May-Aug. at areas B, C, D, G, and North Beach. Excessive trash is being left behind by visitors and is attracting predators like fox, gulls, and crows because the park has an ineffective carry-in carry-out policy.

Coordination/Communication: Increase number of radios for staff to communicate with dispatch when violations occur.

Beach nesting bird management plan: Update management plan.

Outreach: No change

Other: Continue SCA partnership. Increase staff by 1 more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonal, and 4 SCA's. This will allow for 1 staff member at each nesting site.

Sandy Hook – North Gunnison

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 7 days a week by NPS staff, SCA staff and volunteers.

Fencing/Posting: NPS staff prefenced using string-and-post symbolic fence. Signs were placed every 50'. Snow fence was used along the west, north and south sides. White PVC pipe was used to close the intertidal zone with signs in the shape of a stop sign stating: "Area Closed. No One Beyond This Point. No walking, swimming, fishing, kite flying, vehicles or dogs allowed". The intertidal zone was hard to close at north end of this area when the park was not open. Hundreds of people would try to walk on the beach to get to the "clothing optional" beach at South Gunnison from the northern parking area -- additional signs were posted informing visitor to walk down the roadway to get to this beach.

Predator exclosures: Predator exclosures were used on each nest until fox predation became a problem. Exclosures were then fortified with wire hardware cloth covered with sand. After limited success the use of exclosures was discontinued at this site.

Predator control: None undertaken.

Beach management: NPS mechanically rakes next to this beach on the north and south sides. There is an annual beach clean up sponsored by the New Jersey Clean Shores Program from mid March-April 7.

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRA Sandy Hook Unit has a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: BNB brochures were placed at the visitor center and ranger station for beach goers. Junior ranger programs were conducted weekly at North Beach to educate children about endangered species that breed on Sandy Hook. Once chicks hatched and the intertidal zone was closed, staff was stationed at the intertidal zone to educate visitors about Sandy Hook's endangered species.

Nesting Results

Five (5) pairs of piping plovers nested at this site, resulting in 11 nesting attempts. A total of 34 eggs were laid, 8 eggs hatched and no chicks fledged.

A least tern colony (53 maximum adults) was present at the site, although only 1 nest was ever observed. No chicks fledged from this site. The colony failure was due to fox predation.

Recommendations

Monitoring and patrolling: Continue to monitor bayside beaches where adults often feed. Increase staffing levels to guard intertidal zone area on weekends to ensure compliance.

Fencing/Posting: Keep "No Pets on Beach" signs up year-round to educate the public that there are no dogs between March 15-Labor Day.

Predator exclosures: Monitor predators closely and consider using exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use.

Predator control: Have law enforcement issue more violations for pets off their leashes and for littering.

Beach management: Reduce vehicle use by law enforcement after nests hatch. Place dumpsters in parking lots away from the beach from May-August at areas B, C, D, G, and North Beach. Excessive trash is being left behind by visitors and is attracting predators like fox, gulls, and crows because the park has an ineffective carry-in carry-out policy.

Coordination/Communication: Increase number of radios for staff to communicate to dispatch when violations occur.

Beach nesting bird management plan: Update management plan.

Outreach: No change.

Other: Continue SCA partnership. Increase staff by 1 more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonal, and 4 SCA's. This will allow for 1 staff member at each nesting site. This site may even need 2 staff members to ensure compliance.

Sandy Hook – South Gunnison

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 3 days a week by NPS staff, SCA staff and volunteers. The site was difficult to patrol because thousands of nude sunbathers blocked our path. Some staff did not feel comfortable working at this site.

Fencing/Posting: NPS staff prefenced the site using string-and-post symbolic fence. Signs were placed every 50'. Snow fence was used along the west, north and south sides. White PVC pipe was used to stop people from sunbathing in front of nesting area. The intertidal zone was never closed because no nests hatched. This nesting area experienced significant erosion. We had to move the signs back 3 times to protect them from being swept away.

Predator exclosures: None used.

Predator control: None undertaken.

Beach management: NPS mechanically rakes the area immediately adjacent to this beach. There is an annual beach clean up sponsored by the New Jersey Clean Shores Program from mid March-April 7.

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRA Sandy Hook Unit has a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: BNB brochures were placed at the visitor center and ranger station for beach goers. Junior ranger programs were conducted weekly at North Beach to educate the children about Sandy Hook's endangered species.

Nesting Results

One (1) pair of piping plovers attempted to nest here and was present throughout the entire season. However, no eggs were ever found. NPS staff strongly believes fox preyed on the plover eggs before a nest could be located.

One (1) adult least tern observed at this site but it never nested.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: Keep "No Pets on Beach" signs up year-round to educate the public that there are no dogs between March15-Labor Day.

Predator exclosures: Monitor predators closely and consider using exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use.

Predator control: Have law enforcement issue more violations for pets off their leashes and for littering.

Beach management: Reduce vehicle use by law enforcement after nests hatch. Place dumpsters in parking lots away from the beach from May-August at areas B, C, D, G, and North Beach. Excessive trash is being left behind by visitors and is attracting predators like fox, gulls, and crows because the park has an ineffective carry-in carry-out policy.

Coordination/Communication: Increase the number of radios for staff to communicate with dispatch when violations occur.

Beach nesting bird management plan: Update management plan.

Outreach: No change.

Other: Continue SCA partnership. Increase staff by 1 more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonal, and 4 SCA's. This will allow for 1 staff member at each nesting site.

Sandy Hook – Critical Zone

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 7 days a week by NPS staff, SCA staff and volunteers.

Fencing/Posting: NPS staff prefenced using string-and-post symbolic fence. Signs were placed every 50'. White PVC pipe was used to close the intertidal zone with signs in the shape of a stop sign stating: "Area Closed". No One Beyond This Point. No walking, swimming, fishing, kite flying, vehicles or dogs allowed". This was the hardest intertidal site to close because there was a lifeguarded beach on the north and south side.

Predator exclosures: Predator exclosures were used on each nest until fox predation became a problem. Electric fence was tried on 1 nest but the adults abandoned. One exclosure was placed deep into the sand but it was also abandoned. Eventually the use of exclosures was discontinued in this area.

Predator control: None undertaken.

Beach management: NPS mechanically rakes the area immediately adjacent to this beach on the north and south side. There is an annual beach clean up sponsored by the New Jersey Clean Shores Program from mid March-April 7.

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRA Sandy Hook Unit has a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: BNB brochures were placed at the visitor center and ranger station for beach goers. Junior ranger programs were conducted weekly at North Beach to educate children about endangered species that breed on Sandy Hook. Once chicks hatch and the intertidal zone was closed, staff was stationed at both ends of the nesting area by the intertidal zone to educate visitors about Sandy Hook's endangered species.

Nesting Results

Four (4) pairs of piping plovers nested at this site, resulting in 4 nesting attempts. A total of 14 eggs were laid, 3 eggs hatched and 2 chicks fledged.

A least tern colony (75 maximum adults) was present at the site. Although 40 nests were observed, only 2 chicks fledged. Productivity was low (<0.5 fledges per pair) due to fox predation.

Recommendations

Monitoring and patrolling: Continue to monitor bayside beaches where adults often feed. Increase staffing levels to guard intertidal zone area on weekends to insure compliance.

Fencing/Posting: Keep "No Pets on Beach" signs up year-round to educate the public that there are no dogs between March 15-Labor Day. Put cattle fence up between multi-use path and shorebird nesting area.

Predator exclosures: Monitor predators closely and consider using exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use.

Predator control: Have law enforcement issue more violations for pets off their leashes and for littering.

Beach management: Reduce vehicle use by law enforcement after nests hatch. Place dumpsters in parking lots away from the beach from May-August at areas B, C, D, G, and North Beach. Excessive trash is being left behind by visitors and is attracting predators like fox, gulls, and crows because the park has an ineffective carry-in carry-out policy.

Coordination/Communication: Increase number of radios for staff to communicate with dispatch when violations occur.

Beach nesting bird management plan: Update management plan.

Outreach: No change.

Other: Continue SCA partnership. Increase staff by 1 more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonal, and 4 SCA's. This will allow for 1 staff member can be at each nesting site. May also consider having two people at this site to allow for more enforcement.

Sandy Hook – Hidden Beach

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 7 days a week by NPS staff and SCA staff and volunteers. Eight (8) violation notices were issued for walking through the nesting area. Park visitors climbed over snow fence and under symbolic string line to take a short cut to the beach. On one day, 35 people were observed inside the nesting area at one time. Law enforcement was unable to respond since they were overwhelmed on this

very busy day with DWI's and assaults in progress. In addition, the jail cells were all occupied.

Fencing/Posting: NPS staff prefenced using string-and-post symbolic fence. Signs were placed every 50'. Snow fence was used along the western side to prevent visitors from walking from the parking lots over the seawall to the beach. Snow fence was used to make corridors to direct visitors to the beach. White PVC pipe was used to close the intertidal zone with signs in the shape of a stop sign stating: "Area Closed. No One Beyond This Point. No walking, swimming, fishing, kite flying, vehicles or dogs allowed".

Predator exclosures: Predator exclosures were used on each nest until fox predation became a problem. Exclosures were then fortified with wire hardware cloth covered with sand. After limited success the use of exclosures was discontinued at this site.

Predator control: None undertaken.

Beach management: NPS mechanically rakes the area immediately adjacent to this beach. There is an annual beach clean up sponsored by the New Jersey Clean Shores Program from mid March-April 7.

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRA Sandy Hook Unit has a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: BNB brochures were placed at the visitor center and ranger station to beach goers. Junior ranger programs were conducted weekly at North Beach to educate children about endangered species that breed on Sandy Hook. Once chicks hatched and the intertidal zone was closed, staff was stationed at the intertidal zone to educate visitors about Sandy Hook's endangered species.

Nesting Results

Four (4) pairs of piping plovers nested at this site, resulting in 7 nesting attempts. A total of 26 eggs were laid, 7 eggs hatched and 3 chicks fledged.

A least tern colony (71 maximum adults) was present at the site although only a small number of nests (17) were observed. No young fledged from this site. The colony failure was due to fox predation.

Recommendations

Monitoring and patrolling: Continue to monitor bayside beaches where adults often feed. Increase staffing levels to guard intertidal zone area on weekends to insure compliance.

Fencing/Posting: Keep "No Pets on Beach" signs up year-round to educate the public that there are no dogs between March15-Labor Day. Put cattle fence up between multi-use path and shorebird nesting area.

Predator exclosures: Monitor predators closely and consider using exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use.

Predator control: Have law enforcement issue more violations for pets off their leashes and for littering.

Beach management: Reduce vehicle use by law enforcement after nests hatch. Place dumpsters in parking lots away from the beach from May-August at areas B, C, D, G, and North Beach. Excessive trash is being left behind by visitors and is attracting predators like fox, gulls, and crows because the park has an ineffective carry-in carry-out policy.

Coordination/Communication: Increase number of radios for staff to communicate with dispatch when violations occur.

Beach nesting bird management plan: Update management plan.

Outreach: No change.

Other: Continue SCA partnership. Increase staff by 1 more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonal, and 4 SCA's. This will allow for 1 staff member at each nesting site.

Sandy Hook – Fee Beach

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 7 days a week by NPS staff, SCA staff and volunteers. Two visitors where issued violation notices for being in closed area.

Fencing/Posting: NPS staff prefenced with string-and-post symbolic fence. Signs were placed every 50'. Snow fence was used along the west side to prevent visitors from walking from the parking lots over the seawall to the beach. Snow fence was also used to make corridors to divert the visitors to the beach. White PVC pipe was used to close the intertidal zone with signs in the shape of a stop sign stating: "Area Closed. No One Beyond This Point. No walking, swimming, fishing, kite flying, vehicles or dogs allowed."

Predator exclosures: Predator exclosures were used on each nest until fox predation became a problem. Exclosures were then fortified with wire hardware cloth covered with sand. After limited success the use of exclosures was discontinued at this site.

Predator control: Hav-a-heart traps were set at 2 exclosures that were depredated. They were baited for one week until renesting took place. No fox were captured.

Beach management: NPS mechanically rakes immediately next to this beach in the morning. It is not a lifeguarded beach, but is raked due to large amounts of trash left behind by visitors. Some visitors have started to bury their trash and predators are keying in on the scent and are drawn to the beach. There is an annual beach clean up sponsored by the New Jersey Clean Shores Program from mid March-April 7.

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRA Sandy Hook Unit has a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: BNB brochures were placed at the visitor center and ranger station for beach goers. Junior ranger programs were conducted weekly at North Beach to educate children about endangered species that breed on Sandy Hook. Once chicks hatched and the intertidal zone was closed, staff was stationed at the intertidal zone to educate visitors about Sandy Hook's endangered species.

Nesting Results

Six (6) pairs of piping plovers nested at this site, resulting in 12 nesting attempts. A total of 45 eggs were laid, 7 eggs hatched and 5 chicks fledged.

A least tern colony (110 maximum adults) was present at the site although only a small number of nests (14) were observed. Productivity was low (< 0.5 fledges per pair) due to fox predation.

Recommendations

Monitoring and patrolling: Continue to monitor bayside beaches where adults often feed. Increase staffing levels to guard intertidal zone area on weekends to insure compliance.

Fencing/Posting: Keep "No Pets On Beach" signs up year-round to educate the public that there are no dogs between March15-Labor Day. Put cattle fence up between multi-use path and shorebird nesting area.

Predator exclosures: Monitor predators closely and consider using exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use. Trap feral cats and remove smart predators (i.e. red fox).

Predator control: Have law enforcement issue more violations for pets off their leashes and for littering.

Beach management: Place dumpsters in parking lots away from the beach from May-August at areas B, C, D, G, and North Beach. Excessive trash is being left behind by visitors and is attracting predators like fox, gulls, and crows because the park has an ineffective carry-in carry-out policy. Eliminate raking on this beach since it increases the chances of chicks being run over and reduces the wrack line they depend on for foraging.

Coordination/Communication: Increase the number of radios for staff to communicate with dispatch when violations occur.

Beach nesting bird management plan: Update management plan.

Outreach: No change.

Other: Continue SCA partnership. Increase staff by one more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonal, and 4 SCA's. This will allow for 1 staff member at each nesting site.

Sandy Hook – South Fee Beach

BNB Site Manager: NPS – Gateway NRA, Sandy Hook Unit
Summary provided by: Jeanne McArthur-Heuser, Park Ranger, NPS

Management

Monitoring and patrolling: The site was monitored 7 days a week by NPS staff, SCA staff and volunteers.

Fencing/Posting: This new nesting area was fenced and posted after plovers were discovered exhibiting courtship behavior. NPS staff used string-and-post symbolic fence to protect the nesting area. Signs were placed every 50'. Snow fence was used along the west side to prevent visitors from walking from the parking lots over the seawall to the beach. White PVC pipe was used to close the intertidal zone with signs in the shape of a stop sign stating: "Area Closed. No One Beyond This Point. No walking, swimming, fishing, kite flying, vehicles or dogs allowed".

Predator exclosures: None used due to fox predation and abandonment of exclosed nests at other nearby nesting sites.

Predator control: None undertaken.

Beach management: NPS does not mechanically rake this beach. There is an annual beach clean up sponsored by the New Jersey Clean Shores Program from mid March-April 7. Sea Bright PD was observed driving in front of the nesting area on an ATV (even with intertidal zone being closed).

Coordination/Communication: Updates were given weekly to supervisor to keep him informed of current status of plover activity. He forwarded that information as necessary to interested parties.

Beach nesting bird management plan: Gateway NRS Sandy Hook Unit has a shorebird management program documented and on file (Environmental Assessment Management Plan for the Threatened Piping Plover, June 1992).

Outreach: BNB brochures were placed at the visitor center and ranger station for beach goers. Junior ranger programs were conducted weekly at North Beach to educate the children about endangered species that breed on Sandy Hook.

Nesting Results

One (1) pair of piping plovers nested at this new site, resulting in 1 nesting attempt. A total of 4 eggs were laid, 4 eggs hatched and 2 chicks fledged.

A least tern colony (9 maximum adults) was present at this site. Productivity was low (<0.5 fledges per pair) due to fox predation.

Recommendations

Monitoring and patrolling: Continue to monitor bayside beaches where adults often feed. Increase staffing levels to guard intertidal zone area on weekends to ensure compliance.

Fencing/Posting: Keep "No Pets on Beach" signs up year-round to educate the public that there are no dogs between March15-Labor Day. Put cattle fence up between multi-use path and shorebird nesting area. Consider prefencing this site now that nesting has occurred.

Predator exclosures: Monitor predators closely and consider using exclosures on all nests with at least 2 eggs. If smart predators key in on exclosures, discontinue their use.

Predator control: Have law enforcement issue more violations for pets off leashes. Encourage visitors to walk pets on bayside beaches. Trap feral cats and remove smart predators (i.e. red fox).

Beach management: Reduce law enforcement vehicle use after nests hatch.

Coordination/Communication: Park staff needs more radios to communicate with dispatch when violations occur.

Beach nesting bird management plan: Update management plan. Since this is a new site, include it as a designated nesting area.

Outreach: No change.

Other: Continue SCA partnership. Increase staff by 1 more full-time employee and 2 more SCA's for a total of 2 full-time employees, 2 seasonal, and 4 SCA's. This will allow for 1 staff member at each nesting site.

Sea Bright North

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored 7 days a week, including patrolling on both weekend days, by ENSP staff and/or MU interns. ENSP staff patrolled the site during the July 4th fireworks.

Fencing/Posting: ENSP staff and MU interns prefenced (April 12) an area in front of the Grand Pointe Townhouses using string-and-post symbolic fence. Additional nests were protected with string-and-post symbolic fence as they were found. "Area Closed" signs were posted on every third post. After piping plover nests hatched, feeding corridors were created by posting signs ("Nest Hatched", "5 MPH") from the upper beach down to the intertidal zone in areas where chicks were feeding/resting.

Predator exclosures: Although predation (particularly avian) continues to be a major concern at this site, predator exclosures could not/were not used on all nests this year (only on 4 of 10 nests). In 3 cases, the nests were destroyed just after being discovered or just prior to when they were going to be exclosed. In 2 other cases, the nests only went to

2 eggs and were not exclosed due to concern that they might be abandoned. One (1) nest was not exclosed because it was located in a large least tern colony, which ENSP believed provided sufficient protection for the plover nest.

Predator control: None undertaken.

Municipal beach management: The Borough typically does not mechanically rake their beach north of the Ship Ahoy Club (where all nesting has historically taken place). However, at one point during the season the Borough began raking, which, at ENSP's request, was immediately discontinued. The Borough also began erecting snow fence at several locations on the beach during the nesting season. ENSP requested that the Borough suspend this effort during the nesting season and consult ENSP regarding the long-term impacts of any additional dune fence at the site. An annual beach clean-up, where large debris and litter is removed using heavy equipment and a prisoner work force, was conducted in mid-May through the New Jersey Clean Shores program. ENSP staff briefed clean-up supervisors and monitored all work.

Coordination/Communication: Weekly updates were faxed to the municipality to keep them informed of the current status of nesting activity and ENSP management recommendations. Direct contact with the borough was initiated on an as needed basis, primarily thorough the Municipal Clerk and the Public Works Director.

Beach nesting bird management plan: No formal written plan.

Outreach: An interpretive sign was placed at the beach access in front of the Grand Pointe Townhouses. ENSP staff and MU interns provided informal on-site outreach, including the distribution of BNB brochures to interested (and concerned) beachgoers.

Other: Extensive vehicle travel on the beach by the Sea Bright PD (using all-terrain vehicles) continues to pose a threat to unfledged birds and nests, especially since the exact location of chicks/nests continues to be unpredictable at this site.

Nesting Results

Seven (7) pairs of piping plovers nested at this site, resulting in 10 nesting attempts. Four (4) nests hatched. Of the 6 failed nests, 3 were abandoned and 3 were destroyed (likely due to avian predation). A total of 13 chicks hatched, of which 3 fledged.

A least tern colony (104 maximum adults) was present at the site. Productivity for the colony was low (<0.5 fledges per pair). The exact cause of the poor productivity could not be determined although predation of some type was suspected.

Recommendations

Monitoring and patrolling: Continue intense early-season surveying for the entire site, including the area closest to Sandy Hook since nesting took place just within the Sandy Hook boundary this year and evidence of nesting activity was observed on the northernmost portion of the Borough beach earlier in the season.

Fencing/Posting: Continue to prefence an area in front of the Grand Pointe Townhouses, which was done for the first time this year. "No Dog" signs should be posted at all beach accesses, as there are many dog walkers.

Predator exclosures: Because crows, cats, and possibly foxes (moving down from Sandy Hook) were a concern this year, predators should be monitored closely. Exclosures should be used in most cases, although consideration should be given to the fact that some "smart" foxes can cause nest destruction and abandonment despite the use of exclosures (which was the case at Sandy Hook this year).

Predator control: Work with the Borough to better enforce their existing domestic animal ordinances. Trash and recycling cans located on the beach attract crows, gulls, and other scavengers, which pose a threat to nearby nests. Because trash cans are already located behind the seawall at many beach accesses, they could be removed from the beach entirely (or at least placed well away from nesting areas).

Municipal beach management: All dune fence projects should be completed before the start of the nesting season (April 1). In addition, the Borough should consult ENSP prior to undertaking dune management projects (north of the Ship Ahoy Club) to ensure that they are conducted in a manner compatible with nesting birds. The annual Clean Shores Program beach clean-up should be scheduled before the start of the nesting season (April 1) in order to minimize disturbance of the birds. If this is not feasible, activities should continue to be monitored and supervised by ENSP for the duration of the clean-up.

Coordination/Communication: Work to improve communication with the Borough, especially in regards to any municipal projects being planned for the beach and beach management polices in general that could adversely affect nesting birds and their habitat. A meeting between ENSP, USFWS, USACE and all appropriate Borough staff (PWD, PD, administrative staff, Borough Council, etc.) would be beneficial towards achieving this aim.

Beach nesting bird management plan: Work with the Borough and appropriate agencies (USFWS, USACE) to initiate the development of a written BNB management plan. As the importance of this nesting site continues to grow, this is considered a high priority.

Outreach: No basic change, although additional outreach opportunities should be sought within the community.

Other: Although the Sea Bright PD has been responsive about lowering the speed of their ATV's near nesting areas, the number of vehicle trips (patrols) is still extremely high (more than any other municipal law enforcement observed in the state). Seek assistance from USFWS in resolving continued problems with this issue.

Monmouth Beach North

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored 7 days a week, including patrolling on both weekend days, by ENSP staff and/or MU interns. A MU intern and volunteers patrolled the site during local July 4th fireworks displays.

Fencing/Posting: ENSP staff, MU interns and MU volunteers prefenced (April 12) two large areas directly north and south of the MBCC using string-and-post symbolic fence. A second strand of polypropylene rope was used as part of the fence in order to provide additional protection. The fence was expanded significantly at both the southern and northern ends of the prefenced areas (including into the Borough of Sea Bright) because of the large least tern colony that was present at the site. "Area Closed" signs were posted on every third post. A "No Dog" sign was placed at the main public access in front of the MBCC. After piping plover nests hatched, feeding corridors were created by posting signs ("Nest Hatched", "5 MPH") from the upper beach down to the intertidal zone in areas where chicks were feeding/resting.

Predator exclosures: Due to avian predation and harassment in recent years, exclosures were considered for all nests and actually used on 2 of 3 nests. One (1) nest was not exclosed because the nest was destroyed just before an exclosure was scheduled to be erected.

Predator control: None undertaken.

Municipal beach management: This site is not mechanically raked. An annual beach clean-up, where large debris and litter is removed with heavy equipment and a prisoner work force, was conducted in mid-May through the New Jersey Clean Shores Program. ENSP staff briefed clean-up supervisors and monitored all work.

Coordination/Communication: This site falls within two municipalities: Monmouth Beach and Sea Bright. Weekly updates were faxed to both municipalities to keep them informed of the current status of nesting activity and ENSP management recommendations. No direct contact was necessary with either Borough this year for this site, although it is usually done through the Municipal Clerk in Sea Bright and the Mayor in Monmouth Beach.

Beach nesting bird management plan: No formal written plan.

Outreach: An interpretive sign was placed at the beach access in front of the MBCC. In addition, an interpretive sign is permanently placed at the entrance to the MBCC building in the main parking lot for this beach. ENSP staff and MU interns provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting Results

Two (2) pairs of piping plovers nested at this site, resulting in 3 nesting attempts. Two (2) of the nests hatched. One (1) nest was destroyed, likely due to an avian predator. A total of 7 chicks hatched, of which 5 fledged.

A least tern colony (281maximum adults) was present at the site. Productivity for the colony was low (<0.5 fledges per pair). The exact cause of the poor productivity could not be determined although predation of some type was suspected.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: Continue to prefence the areas directly north and south of the MBCC since they harbor the majority of nesting activity. However, because the most recent phase of an USACE beach renourishment improved habitat for the entire site, evaluate (in March) if other areas also need to be prefenced.

Predator exclosures: With the continued presence of crows, exclosures should continue to be considered for all piping plover nests.

Predator control: Closer monitoring of predator activity is necessary since least tern productivity was extremely poor this year and the exact cause could not be determined.

Municipal beach management: The annual Clean Shores Program beach clean-up should be scheduled before the nesting season begins (April 1) in order to minimize disturbance to the birds. If this is not feasible, activities should continue to be closely monitored and supervised by ENSP for the duration of the clean-up.

Coordination/Communication: Work with Monmouth Beach to control the ad hoc construction and placement of volleyball courts on the beach by the public.

Beach nesting bird management plan: Work with both Boroughs and appropriate agencies (USFWS, USACE) to initiate the process of developing a written BNB management plan.

Outreach: No basic change, although additional outreach opportunities should be sought within the community. This includes reestablishing contact with MBCC to conduct a BNB presentation for the public.

Other: The proliferation of private beach accesses over the seawall is a concern (especially in those years when a large least tern colony is present) because they fragment nesting habitat and increase human activity close to the birds. It is unclear what the most effective means to deal with this issue is in the short term, although a long-term solution would be to address it in a BNB management plan. Investigate the permitting process and legal issues concerning private beach accesses at this site.

Monmouth Beach South

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: This site was monitored 5 days a week by ENSP staff and/or MU interns. This included limited weekend patrolling once a brood of piping plover chicks from Seven Presidents Oceanfront Park moved to this site.

Fencing/Posting: ENSP staff, MU interns and MU volunteers prefenced (April 12) two small areas just south of the Borough pool/beach using string-and-post symbolic fence. A second strand of polypropylene rope was used as part of the fence in order to provide additional protection. “Area Closed” signs were posted every other post. After a brood of

piping plover chicks moved to the site, a feeding corridor was created by posting signs ("Nest Hatched", "5 MPH") from the upper beach down to the intertidal zone in areas where chicks were feeding/resting.

Predator exclosures: No piping plover nests were found at this site, so exclosures were not necessary.

Predator control: None undertaken.

Municipal beach management: The Borough does not mechanically rake the beach at this site. An annual beach clean-up, where large debris and litter is removed with heavy equipment and a prisoner work force, was conducted in mid-May through the New Jersey Clean Shores Program. ENSP staff briefed clean-up supervisors and monitored all work.

Coordination/Communication: Weekly updates were faxed to the municipality to keep them informed of the current status of nesting activity and ENSP management recommendations. No direct contact with the Borough was needed this year for this site, although it is usually done through the Mayor.

Beach nesting bird management plan: No formal written plan.

Outreach: An interpretive sign was placed at the northern end of the fenced areas, closest to the Borough pool/beach. ENSP staff and MU interns provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting Results

One (1) brood of piping plover chicks, which hatched from Seven Presidents Oceanfront Park, moved to this site several days after hatching. The brood consisted of 4 chicks, 2 of which fledged. A single plover was observed conducting nesting activity (nest scraping) at this site for several weeks early in the season.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: Although no nests were found this year, consider prefencing the site if suitable habitat still exists. Nesting is possible in the future and any piping plover chicks that hatch from Seven Presidents Oceanfront Park might move to this site again since human activity at the Park is extremely heavy.

Predator exclosures: Consider predator exclosures for any piping plover nests because predator activity is still high at this site.

Predator control: Work with the municipality to better enforce the existing local dog ordinance. Monitor cat activity (feral and domestic).

Municipal beach management: The annual Clean Shores Program beach clean-up should be scheduled before the nesting season begins (April 1) in order to minimize disturbance of the birds. If this is not feasible, activities should be closely monitored and supervised by ENSP for the duration of the clean-up.

Coordination/Communication: No change.

Beach nesting bird management plan: Work with the Borough and appropriate agencies (USFWS, USACE) to initiate the process of developing a written BNB management plan.

Outreach: No basic change, although additional outreach opportunities should be sought within the community. This includes reestablishing contact with MBCC to present a BNB slide show to the public.

Seven Presidents Oceanfront Park

BNB Site Manager: NJDFW-ENSP and Monmouth County Park System
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored 5-7 days a week, including limited weekend patrolling, by both ENSP staff and/or MU interns. Park staff provided additional patrolling on a daily basis. The site was monitored by ENSP staff before and after the July 4th fireworks display.

Fencing/Posting: The Park has created several protected "natural areas" on the beach with the use of snow fence. Once actual nesting activity was discovered by ENSP in 2 of these areas, Park staff placed additional rope-and-post symbolic fence around the nesting sites at the south end of the park (for least terns) and near Avenel Blvd. (for piping plovers). A combination of "Area Closed" signs provided by ENSP and other signs created by the Park were placed on every post. After the piping plover nest hatched, a feeding corridors was created by posting signs ("Nest Hatched") from the upper beach down to the intertidal zone in areas where chicks were feeding/resting (in front of the fenced area at Avenel Blvd.).

Predator exclosures: A predator exclosure was used on the single piping plover nest. Park staff assisted with placement of the exclosure.

Predator control: None undertaken.

Park beach management: The Park extensively rakes their beach except for the areas they have designated (and fenced) as natural areas. In addition, the ongoing servicing of trashcans, the existence of several lifeguard stands and the intense public usage of the Park in general results in heavy human disturbance to nesting birds.

Coordination/Communication: Weekly updates were faxed to the Park to keep them informed of the current status of nesting activity and ENSP management recommendations. In addition, several on-site meetings were held with Park staff once nesting activity was discovered and at various stages during nesting. These face-to-face meetings were largely due to the fact that this was the first year that piping plover nesting occurred within the Park. ENSP staff also conducted a BNB slide show to educate Park staff and train them so they could serve as qualified piping plover chick monitors (as was outlined in the management plan).

Beach nesting bird management plan: A limited plan was developed by ENSP and agreed upon by Park administration once piping plover nesting was confirmed within the park this year. The plan's primary purpose was to address the effects of motor vehicle use (including beach raking) on nesting piping plovers and to ensure that the Park was in compliance with USFWS recommendations for the management of recreational activities in piping plover breeding habitat. Within this context, the plan addressed monitoring frequency, fencing needs, vehicle buffers and the division of management responsibilities. The Park fully cooperated with all aspects of the plan, although piping plover brood monitoring by the Park staff was not implemented because chicks moved outside of the park almost immediately after hatching.

Outreach: An interpretive sign (provided by ENSP) was erected by the Park staff at the southern end of the park overlooking the least tern nesting area. Otherwise, ENSP's public outreach at the site was limited to speaking with beachgoers on an informal basis.

Nesting Results

One (1) pair of piping plovers nested at the site, resulting in 1 nesting attempt. The nest successfully hatched 4 chicks, of which 2 fledged. The brood of chicks (and adults) moved to an adjacent site (Monmouth Beach South) several days after hatching and remained at that site until fledging.

A least tern colony (86 maximum adults) was present at the site. Productivity for the colony was low (<0.5 fledges per pair).

Recommendations

Monitoring and patrolling: Because this is a new nesting site for piping plovers with no established nesting pattern and public usage is heavy at the Park, ENSP should begin regular monitoring in early April so that nesting activity is discovered as soon as possible.

Fencing/Posting: Fence should be placed as soon as focused nesting activity (not just a nest) is detected by ENSP.

Predator exclosures: Consider using exclosures on all piping plover nests as there were continual sighting of crows and gulls near nesting areas at the Park.

Predator control: No change.

Park beach management: Should follow BNB management plan that was developed this year.

Coordination/Communication: Continue close communication with Park staff, including weekly faxing of updates. Frequency of on-site meeting should decrease in the future now that most major management issues have been addressed and a BNB plan is in place. However, annual "training" of Park staff as piping plover brood monitors should be offered by ENSP. Training should be conducted as early as practical so that the Park staff can independently monitor the chicks (as outlined in the management plan).

Beach Nesting Bird Management Plan: Continue to implement the already agreed upon management plan.

Outreach: Offer to conduct a BNB slide show at the Park for the general public.

Long Branch

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored 5 days a week, including limited patrolling on both weekend days, by ENSP staff and/or MU interns. ENSP staff patrolled the site during the July 4th fireworks display, as well as a smaller fireworks display in June.

Fencing/Posting: Nesting occurred in a large one-block area of the beach (between Melrose and Laird Avenues) that had been fenced off with 10-foot high chain link fence in order to keep the public away from a large construction site located just west of the boardwalk. A portion of the fence (oceanfront side) was knocked down by storm tides and could not be repaired because of its proximity to nesting activity. ENSP staff erected string-and-post symbolic fence in its place. Area Closed" signs were posted on both ends of the existing construction fence and on all the symbolic fence posts. After the piping plover nest hatched, a feeding corridor was created by posting signs ("Nest Hatched", "5 MPH") from the upper beach down to the intertidal zone in areas where chicks were feeding/resting.

Predator exclosures: A predator exclosure was used on the single piping plover nest. ENSP determined this was necessary because crows were observed in the area and nearby sites have a history of avian predation problems.

Predator control: None undertaken.

Municipal beach management: The area where nesting took place would have normally been mechanically raked by the City, however, due to the placement of the construction fence it was not raked. ENSP requested that the area directly in front of the fence also not be raked. The City closed a vehicle access located immediately south of the construction fence. The City's BP and PWD frequently drove in front of the nesting area, although ENSP requested that vehicle use be limited to emergency and "essential" uses.

Fireworks: An extensive July 4th fireworks display is usually launched in close vicinity to the area where nesting took place. In addition, several smaller fireworks displays are typically held throughout the season by the Ocean Place Hotel (located on the block directly north of the nesting area). ENSP and USFWS-NJFO worked with City officials to move the launch site about ¼ mile north of the actual nesting site, as well as coordinate crowd control and monitoring associated with viewing of the fireworks.

Coordination/Communication: Weekly updates were faxed to the City to keep them informed of the current status of nesting activity and ENSP management recommendations. Because this was the first time that nesting occurred in the City and its proximity to a large scale redevelopment project meant it potentially impacted the construction schedule, several on-site meetings were held with City officials. In addition, several on-site meeting were held between ENSP, USFWS-NJFO and the City to address issues related to fireworks. Personal communications with City officials also occurred via telephone and e-mail throughout the season.

Beach nesting bird management plan: No formal written plan.

Outreach: ENSP staff and MU interns provided informal on-site outreach, including the distribution of BNB brochures on-site to interested beachgoers.

Nest Results

One (1) pair of piping plovers nested at the site, resulting in 1 nesting attempt. Four (4) chicks hatched from the nest, of which 1 fledged. An additional male piping plover was present at the site for much of the season.

A least tern colony (128 maximum adults) was present at the site. Productivity for the colony was low (<0.5 fledges per pair).

Recommendations

Monitoring and patrolling: The construction fence that created the undisturbed nesting area will likely not be present next year as this portion of the beach is slated for development. Therefore, the exact location where nesting took place this year has little long-term nesting potential. Nonetheless, all nearby viable habitat should be surveyed in early April for evidence of nesting activity.

Fencing/Posting: String-and-post symbolic fence should be erected by ENSP as soon as focused nesting activity is detected (rather than waiting for a nest to be located). Consideration should be given to developing Spanish language signs for this site (and others in the region).

Predator exclosures: No change.

Predator control: No change.

Municipal beach management: If piping plover nesting occurs again in the City, stronger restrictions should be placed on vehicle traffic that is allowed to pass in front of/near the nesting area. A 5 MPH speed limit should be more strictly enforced near the nesting area. Beach raking should be limited in the areas where nesting occurs - similar to the arrangement between the City and ENSP this year.

Fireworks: If nesting occurs again in the vicinity of the fireworks launching or viewing areas, ENSP and USFWS should continue working closely with the City to determine appropriate areas for these activities. Responsibilities and techniques for crowd control during the fireworks need to be more explicit.

Coordination/Communication: In additional to continuing to provide weekly faxed updates to the City during the nesting season, ENSP should meet in-person with the City's PWD, BP and any other appropriate municipal workers early in the season to educate them of the possible threats their activities pose to nesting birds. Although ENSP and the City worked closely and cooperatively with regards to the fireworks, better coordination is needed with City workers who are setting up for the fireworks or conducting crowd control during the fireworks.

Beach nesting bird management plan: USFWS-NJFO met with City officials this year to discuss a BNB (and sea beach amaranth) management plan, which the City is in the process of drafting.

Outreach: If nesting occurs in the future, an interpretive sign should be placed near the nesting area.

Belmar - Shark River Inlet

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored at least 3 days a week by ENSP staff and/or MU interns.

Fencing/Posting: ENSP staff prefenced (April 12) the site using string-and-post symbolic fence. A second strand of polypropylene rope was used as part of the fence in order to provide additional protection. “Area Closed” signs were posted on every other pole.

Predator exclosures: No piping plovers nested at the site, so exclosures were not necessary.

Predator control: None undertaken.

Municipal beach management: Municipal workers used the vehicle access which runs directly behind (and next to) the fenced nesting area on a semi-regular basis. This included bringing a beach rake on the beach at this location even though the immediate area from the fishing pier to the jetty was not raked (at ENSP and USFWS request). A row of trashcans that were placed just inside of the jetty required ongoing servicing with the use of a vehicle.

Coordination/Communication: ENSP and USFWS-NJFO met with a Borough PWD employee prior to the season to discuss management issues at the site. No other regular communication took place.

Beach nesting bird management plan: No formal written plan.

Outreach: None undertaken.

Nest Results

A least tern colony (48 maximum adults) was present at the site early in the season but was abandoned before any nests hatched. The cause of failure was likely related to avian predation. Nesting habitat was only considered marginally suitable for least terns since dense vegetation (primarily seaside goldenrod) encroached on what was already a small nesting area.

Recommendations

Monitoring and patrolling: No change.

Fencing and posting: If habitat remains marginal (which is likely barring any intervention) fence should be erected once nesting activity is observed rather than prior to the season.

Predator exclosures: No change

Predator control: Avian predators, which are difficult to control when dealing with least terns, are considered the primary threat at the site. Local residents have indicated that mammalian predators may also be present at the site. Monitor predator levels in the area to determine if any control measures would be beneficial.

Municipal beach management: Minimize municipal vehicle use near the nesting area in order to lessen disturbance factors. Since other vehicle accesses exist just a few blocks south of the nesting area, encourage the Borough to use those areas during the nesting season, except in the case of an emergency. Approach the Borough about whether garbage cans (which are primarily for fisherman using the jetty) would be just as effective at the beach entrance/exit (just off the beach), so that vehicles would not have to be driven in this area to service them.

Coordination/Communication: If nesting occurs, reestablish more regular communication with the borough, including weekly faxed updates.

Beach nesting bird management plan: No change.

Outreach: Include BNB information on a kiosk being planned for near the site.

Sea Girt-Wreck Pond

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored at least 5 days a week, including limited patrolling on both weekend days, by ENSP staff and/or MU interns.

Fencing/Posting: ENSP staff prefenced (April 12) the site using string-and-post symbolic fence. As least tern nests were found outside the original perimeter, the fence was expanded several times. “Area Closed” signs were posted on every third post. After the piping plover nest hatched, a feeding corridor was created by posting signs (“Nest Hatched”, “5 MPH”) from the upper beach down to the intertidal zone in areas where chicks were feeding/resting.

Predator exclosures: A predator exclosure was used on 1 of the 2 piping plover nests at the site. The first nest was destroyed before becoming a full clutch and therefore was not exclosed.

Predator control: None undertaken.

Municipal beach management: The nesting area falls within two municipalities: Spring Lake and Sea Girt. Both Boroughs regularly mechanically rake their beaches, but at ENSP request, they did not rake in the vicinity of the nesting area. Sea Girt was askedto avoid raking beyond their northernmost lifeguard stand and Spring Lake was asked to avoid raking beyond the southern end of the boardwalk. Also at ENSP request, Sea Girt was asked to use the Terrace Street vehicle access (which runs directly behind and next to the nesting area) for emergency purposes only. Spring Lake was asked to limit use of a vehicle access at the southern end of the boardwalk as much as possible and, if use was necessary, vehicles were to turn immediately north away from the nesting area. Both

municipalities generally complied with ENSP requests, although unnecessary vehicle use and occasional lapses in following the beach raking protocol occurred.

Coordination/Communication: Weekly updates were faxed to both Boroughs to keep them informed of the current status of nesting activity and ENSP management recommendations. In several instances, ENSP had to contact both Boroughs (via fax or telephone contact) to reinforce beach raking restrictions that were not being followed. Since this was the first time that piping plovers nested at this site, USFWS guidelines for the management of recreational activities in piping plover breeding areas was mailed to both boroughs by ENSP as soon as nesting at the site was confirmed.

Beach nesting bird management plan: No formal written plan.

Outreach: ENSP staff and MU interns provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting Results

One (1) pair of piping plovers nested at this site, resulting in 2 nesting attempts. The first nest was destroyed by an undetermined predator. The second nest (which was exclosed) hatched 2 chicks, of which 1 fledged.

A least tern colony (191 maximum adults) was present at the site. Productivity for the colony was low (<0.5 fledges per pair). The exact cause of the poor productivity was not determined although predation of some type was suspected. Human disturbance was also high in this area.

Recommendations

Monitoring and patrolling: Surveying should begin in early April since plovers have now nested at this site. More attention should be paid to the entire stretch of Sea Girt's beach since suitable habitat exists and another nesting site is located at the southern end of the Borough.

Fencing/Posting: Prefencing should be conducted no later than mid-April now that plovers have nested at this site. Fence should be expanded on the Spring Lake side to provide a bigger nesting area and disturbance buffer. Try to enlist volunteer help for the fencing from the Wreck Pond Watershed Association.

Predator exclosures: Exclosures should be considered on all piping plover nest attempts because of predation on the initial plover nest (and on some tern nests).

Predator control: No change.

Municipal beach management: Municipal vehicle use of the Terrace Street access should be limited to emergency usage during the nesting season, especially since another vehicle access exists about one block south (near the lighthouse). Discuss with the Borough (Sea Girt) the feasibility of rerouting pedestrians that use the Terrace Street access away from the nesting area. Increase compliance with raking recommendations with both Boroughs since raking occasionally occurred too close to the nesting site.

Coordination/Communication: No basic change, although an in-person meeting with both Boroughs (including PWD, BP and any other appropriate municipal workers) to review how their activities can impact nesting would be beneficial.

Beach nesting bird management plan: A written BNB plan should be considered for both Boroughs.

Outreach: An interpretive sign should be placed at the site. Work with the Wreck Pond Watershed Association to develop other outreach opportunities.

Other: A long-term goal at this site should be the creation of access to the pond outflow directly behind the nesting site so that piping plover chicks have an alternative feeding site other than the oceanfront.

Sea Girt - National Guard Training Center

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored at least 3 days a week during the early nesting season by ENSP staff and/or MU interns. After determining that the least tern colony had abandoned the site and no piping plover nesting activity was likely, monitoring was reduced to about once a week.

Fencing/Posting: ENSP staff prefenced (April 12) the northern half of the beach using string-and-post symbolic fence. “Area Closed” signs were posted on every third post.

Predator exclosures: No piping plovers nested at this site so exclosures were not necessary.

Predator control: None undertaken.

Beach management: As agreed upon by NGTC and ENSP, the northern portion of the beach (where nesting has taken place in the past) was not mechanically raked. The southern half of the beach is raked and used as a recreational beach. NGTC contracts beach raking and lifeguard services for the recreational portion of the beach from the Borough of Sea Girt. BP drives in front of the nesting area (primarily on quads) to reach the recreational beach.

Coordination/Communication: Updates were faxed every other week to the NGTC, the New Jersey Department of Military and Veteran Affairs - Office of Environmental Compliance (which acts as a liaison) and the Borough of Sea Girt to keep them informed of the current status of nesting activity and ENSP management recommendations.

Beach nesting bird management plan: No formal written plan, however, NGTC is developing an Integrated Natural Resources Management Plan that will have a BNB component.

Outreach: An interpretive sign (provided to NGTC by ENSP) is permanently placed near the main access leading to the recreation beach.

Nesting Results

No piping plovers nested at the site this season, although a single male was observed "scraping nests" early in the season.

A least tern colony (26 maximum adults) was present at the site. However, only a small number of nests (4) were found and the colony abandoned early in the season. The exact cause of abandonment could not be determined, although the presence of foxes, dogs and human trespassers within the fenced nesting area continues to be a problem at the site.

Recommendations

Monitoring and patrolling: Surveying should continue to be initiated early in the season (April) for the possibility of piping plover nesting.

Fencing/Posting: No basic change. However, "No Dog" signs should be posted at either end of the NCTC beach as they have a no dog policy, but dog walkers are frequently observed at the site.

Predator exclosure: If piping plovers attempt to nest at this site again, exclosures should be considered for all nest attempts because predator activity remains high.

Predator control: Because of the continued poor success of the tern colonies (likely due to predation), ENSP staff should attempt to clearly identify predator species. Work with the NGTC to assess the feasibility of managing foxes (and other predator species) at the site. Work with the NGTC to develop a strategies (e.g. more signage, outreach, etc.) to increase public compliance with the no dog policy.

Beach management: No change.

Coordination/Communication: No change.

Beach nesting bird management plan: Work with NGTC to develop the BNB portion of their Integrated Natural Resources Management Plan. Since the plan is not expected to be completed until September 2004, interim measures, consistent with current beach management practices, should be undertaken during the 2004 nesting season.

Outreach: No basic change, although the frequency of ENSP monitoring could be increased as a means to educate the general public and dog-walkers at this site about the potential negative impacts of their activities on nesting birds.

Island Beach State Park – Dike

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site twice weekly, including limited patrolling on 1 weekend day. ENSP staff also surveyed the oceanfront portion of the Park for nesting activity several times from April-June.

Fencing/Posting: The upper portion of the dike is permanently fenced with a combination of snow fence and wire pasture fence. However, the piping plover nests and black skimmer colony were located on the northern down slope of the dike in an area that was not prefenced. ENSP fenced those areas with string-and-post symbolic fence as nests were found "Area Closed" signs were posted on every third post.

Predator exclosures: Predator exclosures were used on 2 piping plover nests.

Predator control: None undertaken.

Beach management: No active management (e.g. beach raking, placement/servicing of trashcans, etc.) is conducted by NJDPF at this site. No public vehicle usage is permitted on this portion of the beach.

Coordination/Communication: Updates were faxed to NJDPF every other week to keep the Park informed of the current status of nesting activity and ENSP management recommendations.

Beach nesting bird management plan: No formal written plan.

Outreach: An interpretive sign, developed and placed by NJDPF, is permanently placed at the eastern end of the site.

Nesting results

Two (2) pairs of piping plovers nested at the site, resulting in two 2 nesting attempts. The outcome of one nest could not be determined since 2 of the 3 eggs in the nest disappeared close to the hatch date but no chicks were ever seen. The other nest hatched 4 chicks, of which 1 fledged. An additional unpaired adult (male) was present at the site for most of the nesting season.

A least tern colony (17 maximum adults) was present on the upper portion of the dike. Productivity for the least terns was moderate ($\geq$0.5 to <1.0 fledges per pair).

A black skimmer colony (83 maximum adults, but only 7 active nests) was present on the north side of the dike close to where the plovers nested. The black skimmers failed to hatch any young. Avian predation was the suspected cause of failure.

Recommendations

Monitoring and patrolling: Increase monitoring frequency, especially early in the season.

Fencing/Posting: NJDPF should assist ENSP in the fencing of nesting areas that are not already fenced. There are not enough "Area Closed" signs on the upper portion of the dike that is permanently fenced. ENSP will provide NJDPF with more signs so they can adequately post the area. The signs should be removed at the end of the nesting season since they fade quickly when left out year-round. Kayakers (both independently-operated and as part of park-sponsored trips) often land near the plover nesting/foraging area on the north side of the dike. Signs should be developed and placed by NJDPF on the north side of the dike to let kayakers know that they are entering a nesting/foraging area and that human activity should be limited in this area.

Predator exclosures: Since this site has predator problems (most notably gulls from a nearby nesting colony), use of exclosures should be considered in all cases. The fox population, which has historically been high in the Park, appears to have dropped significantly. If the fox population rebounds, consider use of electric fence in conjunction with predator exclosures.

Predator control: Dogs should be prohibited from the dike area during the nesting season (April 1–September 15). Signs should be placed by NJDPF at several access points, including where boats land to, to indicate this.

Beach management: No basic change. However, if NJDPF plans to erect any additional fence in the dike area, they should consult with ENSP to ensure that it is placed in a manner that is compatible with nesting birds and the maintenance of habitat.

Coordination/Communication: No change.

Beach nesting bird management plan: Encourage NJDPF to formally designate this site as a protected bird nesting area and work with them to develop a BNB management plan for this area.

Outreach: Encourage NJDPF to post BNB information at their Interpretive Centers and other appropriate locations within the Park. (ENSP will provide brochures.) In addition, BNB information could be incorporated into park-sponsored programs.

Barnegat Light

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site at least 3 times a week, including limited patrolling on 1 weekend day.

Fencing/Posting: ENSP staff and WCC volunteers prefenced (April 5) a large area adjacent to the Barnegat Inlet with string-and-post symbolic fence. A second strand of polypropylene rope was used as part of the fence in order to provide additional protection. An area between 13th and 14th Street was also prefenced with a combination of string-and-post symbolic fence and wire pasture fence. An area between 15th and 17th Street was fenced with string-and-post symbolic fence once breeding activity was observed. “Area Closed” signs were posted on every third post. After piping plover nests hatched, signs (“Chicks Hatched”, "5 MPH") were posted to indicate areas where chicks were feeding.

Predator exclosures: Predator exclosure were used on 2 of 3 nesting attempts.

Predator control: None undertaken.

Municipal beach management: The Borough does not mechanically rake any portion of their beach. Although the Borough limits vehicle use near the nesting area at the jetty, other areas of the beach (south of 9th Street) receive heavy vehicle use, primarily from PWD and BP.

Coordination/Communication: Weekly updates were faxed to the Borough to keep them informed of the current status of nesting activity and ENSP management recommendations.

Beach nesting bird management plan: No formal written plan.

Outreach: An interpretive sign was placed at the northwest corner of the fenced area along the jetty. ENSP staff provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting results

Three (3) pairs of piping plovers nested at the site, resulting in 3 nesting attempts. Two (2) of the 3 nests hatched. One (1) nest was lost to undetermined causes. A total of 6 chicks hatched, of which 4 fledged. An additional unpaired adult was present between 13th and 16th Street for most of the nesting season.

A least tern colony (6 maximum adults) was present in the area between 15th and 17th Streets. Productivity was low (<0.5 fledges per pair). Predator (crows, gulls and foxes) and human activity was high in this area.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: String-and-post symbolic fence (with two strands of string/rope) should still suffice for prefencing in the area near the jetty. ENSP staff should also continue to prefence an area between 13th and 16th Streets (assuming sufficient habitat remains). Other areas should be fenced as nests are discovered because nesting patterns are not well established and/or habitat is changeable in these areas.

Predator exclosures: As this site has a history of predator problems (both avian and mammalian), use of exclosures should be considered in most cases.

Predator control: No change.

Municipal beach management: Heavy municipal vehicle usage in the area between 12th and 18th Streets, where nesting has occurred the last several years, continues to be a problem. Although prefencing in this area has created protected habitat where plovers and terns can set up territories, unfledged chicks are still at high risk. In general, vehicle usage should be limited as much as possible in areas where nesting occurs. Encourage PWD and BP to drive on and off the beach at 22nd and 30th Streets as much as possible, especially when heading to southern portions of the beach (instead of driving back and forth on the beach to get on and off at 9th Street). The pattern of servicing trash/recycling cans continues to be a problem in the area between 12th and 18th Streets. PWD drives along the base on the dunes (sometimes in the dunes) to pick up cans, which places unprotected nests and/or unfledged chicks at risk. Work with the PWD to develop a way to service the area in a manner that is less harmful to nesting birds.

Coordination/Communication: ENSP should hold a meeting with the Borough to educate PWD, BP and Long Beach Township PD about the negative impacts of vehicle use on nesting birds and seek changes in vehicle use patterns by these departments.

Beach nesting bird management plan: Work with the Borough to initiate the process of developing a BNB management plan.

Outreach: No change.

Other: As habitat suitability for nesting birds continues to degrade along the inlet, ENSP should explore long-term options to improve the nesting habitat in this area.

Holgate

BNB Site Manager: USFWS – Forsythe NWR
Summary provided by: Vinny Turner, Wildlife Biologist, USFWS – Forsythe NWR

Management

Monitoring and patrolling: A refuge biologist and summer interns monitored the site 3-4 times a week. Refuge law enforcement officers patrolled the site, on a regular basis on weekends and semi-regularly on weekdays. At other times, law enforcement officers were posted at the Refuge's northern boundary.

Fencing/Posting: The northern boundary of Holgate is posted with signs indicating that no public access is permitted during the nesting season. The south tip and cove areas are also posted for boaters and personal watercraft operators. No fence is used.

Predator exclosures: A total of 8 predator exclosures were used at the site. Only one nest was abandoned. There were no problems with the exclosures: an occasional gull would walk around exclosures, but no mammalian disturbance.

Predator control: Conducted by U.S. Department of Agriculture – Animal and Plant Health Inspection Service. A fox, opossum, and 2 raccoons were taken from the site, and 2 fox dens were destroyed.

Beach management: None. The site is a federally designated Wilderness Area.

Coordination/Communication: The Refuge oversees all plover activities at the site so no outside coordination is necessary.

Beach nesting bird management plan: The USFWS's Piping Plover (Atlantic Coast Population) Recovery Plan is used for this purpose.

Outreach: Information and updates of plover activities are provided to the public through Refuge volunteers directly at Holgate. Plover updates are also posted on the Refuge website.

Nesting Results

Thirteen (13) pairs of piping plovers nested at the site, resulting in 13 known nesting attempts. Ten (10) of the 13 nests hatched. Of the 3 failed nests, 1 was lost to a mammalian predator, 1 to flooding and 1 to abandonment. A total of 28 chicks hatched, of which 17 fledged.

A least tern colony (60 maximum adults) was present at this site. The colony completely failed, likely due to flooding.

A black skimmer colony (425 maximum adults) was present at the site. Productivity was moderate (>0.5 to <1.0 fledges per pair).

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: No change.

Predator exclosures: No change

Predator control: No change

Beach management: Many historic plover areas at Holgate have been taken over by vegetation. Improve habitat by thinning out native vegetation to allow more suitable nesting/feeding areas.

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: No change.

Little Beach

BNB Site Manager: USFWS – Edwin B. Forsythe NWR
Summary provided by: Vinny Turner, Wildlife Biologist, USFWS – Forsythe NWR

Management

Monitoring and patrolling: A refuge biologist and summer interns monitored the site 3 times a week (weather and tidal conditions permitting since the site is only accessible by boat).

Fencing/Posting: Large (4' x 8') "Area Closed" signs are posted at several highly visible locations around the perimeter of the island. No public access is allowed anytime during the year.

Predator exclosures: None used. It is too physically demanding to carry exclosures by hand a mile (or longer) to nests. There are no other (closer) access points to safely bring them to Little Beach.

Predator control: A trapper was contracted to remove predatory mammals from Little Beach using a snare. Four to six foxes were captured and dispatched.

Beach management: None. The site is a totally undeveloped barrier island with limited access and is a federally designated Wilderness Area.

Coordination/Communication: The Refuge oversees all plover activities at the site so no outside coordination is necessary.

Beach nesting bird management plan: The USFWS's Piping Plover (Atlantic Coast Population) Recovery Plan is used for this purpose.

Outreach: On-site outreach is not conducted at Little Beach since it is closed to the public. Nesting information and updates are posted on the Refuge website.

Nesting Results

Nineteen (19) pairs of piping plovers nested at the site, resulting in 22 known nesting attempts. Twelve (12) of the19 nests hatched. Of the 7 failed nests, 4 were lost to mammalian predators, 2 to flooding and 1 was destroyed by undetermined causes. Three (3) nesting attempts had unknown outcomes. A total of 28 chicks hatched, of which 17 fledged.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: No change.

Predator exclosures: No change.

Predator control: No change.

Beach management: No change.

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: No change.

North Brigantine Natural Area

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site 3-5 times weekly, including patrolling on at least 1 weekend day. The City of Brigantine PD patrolled the area up to the vehicle barrier several times a day.

Fencing/Posting: A combination of prefencing and fence erected once nesting activity or nests were found was employed at this site. String-and-post symbolic fence is left up year round in front of the main overwash and around the dune/overwash area at the northern tip. ENSP repaired this fencing and replaced signs in early April. At ENSP's request, the City (PWD) prefenced an area in front of the "shipwreck" with string-and-post symbolic fence during the first week of April. ENSP had to expand this area considerably as nesting activity occurred outside the original fenced area. ENSP fenced the wide beach area directly north of the "vehicle cut" with string-and-post symbolic fence once significant nesting activity was observed. ENSP fenced 2 small areas south of the main overwash with string-and-post symbolic fence after nests were discovered. "Area Closed" signs were generally placed on every third post in most areas, but on every other post in front of the main overwash. The City placed "No Dog" signs at the vehicle barrier. Other signage was placed in conjunction with the vehicle barrier and is described in that section below.

Vehicle barrier: The vehicle barrier serves two purposes: 1) to protect unfenced nests and nesting areas from vehicle traffic 2) to protect unfledged chicks from vehicle traffic. ENSP requested that the City either prefence nearly the entire northern portion of the NA or put up a vehicle barrier just south of the "vehicle cut" by early April. The City chose to put up the barrier, which was put in place by the City's PWD on April 9. This was the second year in a row that the barrier was placed at this location in early April. The barrier consisted of cedar posts connected by rope running from the dune line down to the high tide line. ENSP added additional metal posts and rope to extend the barrier further into the surf zone in an effort to further prevent trucks from driving around the barrier at low tide. A large "Plover Nesting Area – No Vehicles Beyond This Point" sign (provided to the City by NJDPF) was posted close to the barrier. The barrier was scheduled to be relocated to its "traditional" location about 50 yards south of the main overwash once the first nest(s) hatched in the main overwash (which typically occurs around May 15). However, due to delays in nesting and flooding of numerous nests, the barrier was not relocated this year until considerably later (June 29). In addition, because 2 nests were found well south (~ 1 mile) of the main overwash, ENSP determined that the vehicle barrier needed to be relocated to the NA/City boundary. About a month later (July 25), after the chicks from the two southerly nests moved to the main overwash, the vehicle barrier was relocated close to its "traditional" location just south on the main overwash. The barrier was entirely removed from the NA on August 12 after ENSP determined the last chicks had fledged from the site. Brigantine PWD was responsible for the original installment, all relocations and final removal of the barrier. ENSP determined specific locations and timing for the barrier placement and removal.

Predator exclosures: Predator exclosures were used to protect 8 of the 23 nests. They were strongly considered for all nesting attempts because of the ongoing threat of fox, and possibly raccoon, predation. Electric fencing was used in conjunction with all exclosures to further deter fox. Anti-perching devices were added to the electric fence chargers to prevent avian predators from perching on them. Of the 15 nests that were not exclosed, 10 were destroyed before they went to a full clutch. (ENSP does not typically exclose nests until they reach a full clutch). Of the 5 other nests that were not exclosed; 2 were destroyed just after reaching full clutch but before ENSP could exclose them and 3 were located in extremely flood prone areas where ENSP decided to wait to see if these nests would survive upcoming high tides (which they did not).

Predator control: None undertaken, however, some fox trapping is typically conducted by public during regulated trapping season.

Beach management: This site is a state owned NA, therefore, no active management (i.e. beach raking) occurs on this beach.

Fishing tournaments: A fishing tournament was scheduled by the City for June 28, including on portions of the NA that were not closed to vehicle traffic. However, the vehicle barrier was scheduled to be relocated to the southern border of the NA (closing the entire NA to vehicles) the day before the tournament. ENSP and NJDPF were not aware of the tournament beforehand and agreed (on a one-time only basis) to delay moving the barrier until the day after the tournament. The tournament was closely monitored by ENSP staff and Brigantine BP.

Coordination/Communication: Weekly updates were faxed to the City of Brigantine, NJDPF and NJONLM to keep them informed of the current status of nesting activity and ENSP management recommendations. ENSP met on-site with Brigantine PWD on several occasions to outline fencing needs and the location of the vehicle barrier. ENSP also met on-site with NJDPF (new Superintendent) and the NJONLM to review current and long-term management practices, as well as issues related to signage and vehicle barrier location.

Beach nesting bird management plan: No formal written plan exists, although a licensing agreement between NJDEP and the City of Brigantine (valid through October 2007) outlines management responsibilities that the City is required to perform at the NA in exchange for being able to issue ORV permits for the site.

Outreach: Extensive informal on-site outreach with interested (and concerned) beachgoers and ORV users was conducted by ENSP staff.

Other: In an attempt to increase piping plover nest hatch success at the site, ENSP "raised" two late-season nests that it believed would not survive normal high tides without intervention. In brief, eggs were carefully removed from the nest and then a tapered mound of sand (3' in diameter and 6" high in the center) was created by depositing several buckets of sand over the old nest. A nest depression (with a shell lining) was then recreated and the eggs placed back in the new nest. The procedure took 2 staff members less than 10 minutes to complete. In both cases, the incubating adult immediately returned to the nest and a successful nest exchange was also eventually observed. Over time, several heavy rainstorms flattened out both nest mounds so ENSP "raised" the nests again using the same procedure. Unfortunately, both nests were eventually lost due to full moon tidal flooding. It should be noted that this procedure was only done with nests already protected with a predator exclosure, because disturbance of the nest site/substrate as a result of the procedure may have made the nest more vulnerable to predators.

Nesting results

Seventeen (17) pairs of piping plovers nested at the site, resulting in 23 known nesting attempts. Eleven (11) of the nest attempts were in the main overwash, 3 in the overwash/dune area at the north tip, 3 close to the "shipwreck", 2 on the wide outer beach just north of the "vehicle cut", 2 on the outer beach at the northernmost tip and 2 south of the main overwash (including 1 at the NA/City boundary line). Only 4 of the 23 nests hatched. A total of 15 chicks hatched, of which 6 fledged. Of the 19 nests that failed, 10 were flooded, 5 were lost to undetermined causes (likely either flooding or a predator), 2 were destroyed by a mammalian predator, 1 was destroyed by an avian predator and 1 was abandoned (as a result of ongoing flooding). This was the first year that birds nested south of the main overwash, which was probably the result of deteriorating habitat conditions in the main overwash. The main overwash has progressively been filling in with vegetation and the remaining open areas are low-lying and extremely flood prone. In addition, predators, especially fox, continue to be a problem at the entire site, but especially in the main overwash. Of the 11 nesting attempts in the main overwash, none hatched. While the main overwash was not a productive nesting area, it did continue to

provide alternate feeding habitat for adults and chicks. Both broods of chicks from nests south of the main overwash moved into the overwash to forage.

Recommendations

Monitoring and patrolling: As suitable nesting habitat in the main overwash continues to decline, all other areas should be surveyed more intensively, including the entire stretch of beach south of the main overwash. Several of this year's nests occurred in what would normally be considered "sub-optimal" nesting habitat, making assessment of nesting areas more difficult.

Fencing: In the past, the main overwash was the primary nesting area at the site. Nesting in this area is set back from the oceanfront portion of the beach where most of the vehicle usage and human activity occurs. As nesting activity continues to spread out across the oceanfront beach, both north and south of the main overwash, this has necessitated fencing more areas. Prefencing of nesting areas continues to be an effective management tool at this site as it provides the means to separate vehicle and foot traffic from areas of nesting activity and therefore prevents accidental crushing of eggs by vehicles and walkers. Prefencing also limits disturbance to birds setting up nesting territories and establishing nests. In 2003, ENSP requested that the City prefence an area of suitable nesting habitat close to the shipwreck, which was south of (and therefore not protected) by the original location of the vehicle barrier. Ultimately, as nesting activity expanded in that area, ENSP had to extend the fence erected by the City. Furthermore, even with the vehicle barrier in place at the "vehicle cut" in early April, large areas of the beach north of barrier still needed to be fenced (by ENSP) in order to protect nests from foot traffic. **In the future, as required by the licensing agreement, the City should be responsible for fencing all viable nesting habitat at the NA prior to the start of the nesting season (April 1). ENSP will determine what constitutes viable habitat in early March (although the City should be prepared to fence nearly the entire sand beach portion of the NA).** As per the licensing agreement, the City is responsible for purchasing all fencing materials. (NJDFW will provide nesting signage). A map will be generated by ENSP showing (in general terms) the areas that need to be fenced. ENSP will also meet on-site with the City's PWD in early March to review exactly where fencing needs to be placed. Prefencing of all nesting habitat will allow the City to leave all of the oceanfront (intertidal) portion of the NA open to ORV usage as long as possible (until nests begin to hatch – around May 15). Failure to erect fence prior to the nesting season would result in ENSP recommending that most (possibly all) of the NA be closed to ORV traffic as of April 1. All fencing should be removed from the NA by the City at the end of the nesting season. Encourage the City to seek volunteer assistance for fencing projects from local users groups, such as beach buggy or fishing organizations if they do not have the resources to complete the task themselves. ENSP and NJDPF could assist the City in this regard by arranging a meeting between all interested parties.

Signage: Work with NJDPF to develop appropriate signage for the NA. Placement of an "Entering State Natural Area" sign at the southern boundary of the NA and a list of regulations would clarify for the public exactly where the NA begins and the different regulations that exist from the City owned portion of the beach. The NA has become a frequent dog walking area and dogs pose a serious risk to nesting birds (at all stages of nesting). In the past, "No Dog" signs have been posted by ENSP and the City in

conjunction with the vehicle barrier (at changeable locations). NJDPF should post a large "No Dog" sign at the NA boundary indicating that dogs (leashed and unleashed) are prohibited from April 1-September 15. In addition, the City should post metal "No Dog" signs (that have been used with the vehicle barrier in the past) at the intertidal zone of the NA boundary since most dog walkers access the site along the waterline. NJDPF will provide small metal "Natural Area" signs to the City to post in conjunction with the "No Dog" signs. ENSP staff observed people walking over the dunes in an attempt to get to and from the new observation platform constructed by the City just west of the dunes near the southern end of the NA. The City should post signage and/or create a fenced path directing people to and from the viewing platform in a focused way that does not risk disturbance to nesting birds. "Keep off the Dunes" signs may also be useful in this regard.

Vehicle barrier: This year the vehicle barrier was erected just south of the "vehicle cut" in early April. In the absence of fence to protect the large area of suitable habitat at the northern end of the NA, use of the vehicle barrier to keep this area free of ORV's early in the season provided an undisturbed beach for birds to set up nesting territories and establish nests**. If the City agrees to erect fence to protect <u>all</u> suitable nesting habitat at the NA by April 1 (as recommended by ENSP), the vehicle barrier can be eliminated until later in the season when the first nests hatch (usually about May 15).** Once the first piping plover nest(s) hatches the barrier should be placed far enough south to protect the brood(s) of chicks. The exact location will depend on how far south nesting activity extends and hatch dates of other nests at the site. **If the City chooses <u>not</u> to prefence all suitable habitat, ENSP will recommend placement of the vehicle barrier at the southern boundary of the NA as of April 1. This is not the State's preferred alternative since it effectively closes the NA to all vehicular traffic for the entire nesting season.** Regardless of when or where the barrier is located, the City should extend the barrier further towards into the surf zone to prevent vehicles from driving past it at low tide. The City has been reluctant to do this because posts can be knocked down or washed away during high tides, but ENSP placed metal T-post into the surf this year with good success. As long as poles/posts are deeply pounded into the sand, only occasional maintenance of the poles should be necessary (except in the case of strong storms and/or extremely high tides).

Predator exclosures: ENSP should continue to use predator exclosures and electric fence on all piping plover nests, except in some cases such as with nests in extremely flood-prone areas. Although there was only one nest abandoned this year (and that was likely due to flooding), use of both predator exclosures and electric fence should be closely monitored, as abandonment has been a problem in past years. Anti-perching devices, which were used on electric chargers for the first time this year, proved successful and should continue to be used. A large number of nests were destroyed this year before they reached a full-clutch and before ENSP exclosed them. Many of these nests were lost to flooding, however, some nests either were or were likely lost due to predators. If predator levels remain high and/or nests continue to be lost to predators, ENSP should consider exclosing nests earlier in the egg laying stage.

Predator control: Fox were observed on numerous occasions and regular observations of fox (and raccoon) tracks were made throughout the nesting areas. ENSP should use night-vision binoculars and video equipment (which was tested this year) to study the abundance and effects of predators. If deemed necessary, predator removal should be considered or trapping encouraged during the regular winter trapping season.

Beach management: No active beach management, including the placement of any snow fence for dune protection, should be permitted within the NA.

Fishing tournaments: The southern portion of the NA has been open to ORV use in past years, and therefore the City saw no harm in scheduling a fishing tournament this year on June 28 (that would include that part of the NA**). In general, no fishing tournament or other planned activity should be scheduled by the City on the NA from May 15 – August 31 (when unfledged piping plover chicks are likely to be present).** The City should notify NJDPF (through Bass River State Forest) and NJDFW (through ENSP) when any fishing tournaments or other planned activities are scheduled to take place at the NA.

Coordination/Communication: No basic change, except as otherwise noted in other specific sections of **Recommendations**.

Beach nesting bird management plan: No change.

Outreach: A brochure that the City hands out with ORV permits is confusing and insufficient in regards to birds nesting at the NA. ENSP and NJDPF should work with the City to revise the brochure or produce an insert that directly addresses nesting birds and important restrictions that apply at the NA. The information should clearly and prominently explain that most of the northern end is a state-owned NA, why the NA is closed on a seasonal basis and approximately when the closure will be in effect. Dog restrictions should also be addressed in the brochure, but a separate handout for the general public should be considered if new signage proposed for next year does not effectively control dog walkers.

Law enforcement: Under the terms of the agreement between NJDEP and the City of Brigantine, the City PD is permitted to fully enforce existing restrictions at the NA, including the issuing of tickets for violations. Work with the City to clarify this responsibility and, if necessary, arrange a meeting between the City and NJDPF to discuss this issue.

Other: Although the “raising” of flood prone nests ultimately was not successful this year (because full-moon tides eventually flooded the nests), the method itself proved to be an easy and quick procedure that involved little observed risk. In some very limited cases (i.e. exclosed nest that have an extremely low probability of surviving normal high tide cycle), this procedure could be considered for use in the future.

Ocean City – North

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff and CCRP student researchers monitored the site 7 days a week, including patrolling on both weekend days.

Fencing/Posting: ENSP staff fenced nests with string-and-post symbolic fence as they were discovered. "Area Closed" signs were posted on every third post. After piping plover nests hatched, "Nest Hatched" signs were posted near the nest/feeding areas to alert beachgoers of the presence of chicks. "No Dog" signs were posted at several beach accesses.

Predator exclosures: No predator exclosures were used at this site.

Predator control: The Ocean City Animal Control Officer patrolled the site several times a week during the nesting season to prevent problems with dog walkers. Tickets were issued to repeat offenders.

Municipal beach management: The City did not mechanically rake the beach north of the terminal groin. Municipal vehicle use was limited to emergency use only in the area north of the terminal groin for the entire nesting season.

Coordination/Communication: Weekly updates were faxed to the City to keep them informed of the current status of nesting activity and ENSP management recommendations. In addition, communication between ENSP and the City's PWD was ongoing throughout the season. A mid-season meeting was held with the PWD to discuss both immediate and long-term management concerns with regards to nesting birds on the City's beaches. The meeting primarily focused on management issues in the middle of the city, but vehicle use at the northern site was also discussed.

Beach nesting bird management plan: A draft plan exists and has been used as a working plan between the City and ENSP for the last five years. The city has begun reviewing the plan with the aim of creating an updated version for approval.

Outreach: ENSP staff provided informal outreach, including the distribution of BNB brochures on-site with interested (and concerned) beachgoers.

Other: The habitat at the north end of the city was severely reduced this year due to erosion. As a result there was significantly less nesting at the site this year.

Nesting results

Two (2) pairs of piping plovers nested at this site, resulting in 3 nesting attempts. One (1) nest hatched. Of the 2 failed nests, 1 was lost due to flooding and 1 was abandoned. The abandoned nest was likely the result of the death of one of the adult plovers associated with the nest (bird recovered near nest). The state pathologist could not determine the cause of death of the adult plover. A total of 4 chicks hatched, of which 2 fledged.

A least tern colony (12 maximum adults) was present at the site. The colony completely failed due to persistent flooding, predation and human disturbance. All of the terns abandoned the site by mid-June.

Recommendations

Monitoring and patrolling: A beach renourishment project is scheduled to begin at the north end during the Fall of 2003 and will likely restore some nesting habitat to the area, especially the area south of the terminal groin. No nesting occurred south of the groin last year (the beach was severly eroded), but it has in the past so monitoring of this area should be reestablished next year starting in early April.

Fencing/Posting: Prefencing was not done at the site this year (for the first time in several years) because the beach was so badly eroded and little viable habitat remained. A habitat assessment should be conducted early in the 2004 season (March) to determine if the beach renourishment project (and associated sand drift) restores enough habitat to warrant any prefencing. "No Dog" signs that have been posted by ENSP at access paths have been ineffective since individuals continually rips them down. Work with the City to develop and post more permanent (metal) "No Dog" signs in prominent locations.

Predator exclosures: Consider use of predator exclosures at the site , as an adult piping plover was found dead this year and a history of predation problems (cats and fox) have plagued the site.

Predator control: Monitor predator problems more closely to determine if additional control measures and/or outreach (for cats) are necessary. Continue to encourage the City to enforce their dog ordinance at this site.

Municipal beach management: No change.

Coordination/Communication: No change.

Beach nesting bird management plan: ENSP and the City should update the Ocean City Beach Nesting Bird Draft Management Plan/Agreement with the goal of having it formally adopted by the City and approved by NJDEP and USFWS.

Outreach: Interpretive signs were not used at the site this year because of ongoing flooding (and fear that signs might be washed away). Depending on the habitat conditions, ENSP should resume placing a sign on the beach. Supply the Ocean City Animal Control Officer with BNB brochures and literature about why dogs and nesting birds "don't mix" for distribution during his enforcement efforts.

Ocean City – Center

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff and CCRP student researchers monitored the site 7 days a week, including patrolling on both weekend days. ENSP staff and NJDFW Conservation Officers (4) patrolled the nesting area during the July 4th fireworks display.

Fencing/Posting: ENSP staff protected nests as they were found using string-and-post symbolic fence that supplemented existing snow fence. A second strand of polypropylene rope was used as part of the fence along all access paths in order to provide additional protection. “Detour” signs were also placed near several access paths to guide beachgoers away from nesting areas. “Area Closed” signs were posted on every third post. After piping plover nests hatched, feeding corridors were created by posting signs (“Nest Hatched”, “No Ball Playing, Kite Flying, etc.”, “5 MPH”,) from the upper beach down to the intertidal zone in areas where chicks were feeding/resting.

Predator exclosures: No predator exclosures were used at this site.

Predator control: None undertaken, although an active fox den was located near 21st Street. The City did not have the expertise for fox removal and ENSP was reluctant to remove the fox because of their location on a heavily used beach. The den appeared to be “abandoned” sometime during the middle of the nesting season and piping plover nest hatch success was ultimately high at the site (although nests closest to the den were predated). By late summer/early fall, fox had returned to the den.

Municipal beach management: Management restrictions are addressed in detail in a “draft” version of a BNB management plan. The City does not typically rake the area between 18th and 30th Streets during the nesting season. Raking is phased-in later in the season as plovers leave the site. On several occasions this year raking occurred within the nesting zone while nesting was still ongoing. ENSP also observed an increase in municipal management activity and vehicle use within the nesting zone in the early part of 2003, primarily by the PWD. As a result, ENSP met with the PWD to review existing restrictions outlined in the management plan and discuss other ways to minimize vehicle use. One of the primary issues addressed was the frequent use of the 23rd Street vehicle access, which is in the middle of the nesting zone. It was agreed that the PWD would limit use of this access, and use 29th Street or the accesses north of 18th Street during the nesting season except in emergencies and when no other reasonable route was available. Other issues addressed were reducing the number of trash/recycling cans within the nesting zone, notifying ENSP if major dune work was going to be undertaken in the nesting zone (at any time of the year) and working with ENSP so that any dune work was compatible with nesting birds. ENSP also agreed to be more timely in its response to PWD requests or inquires about management (e.g. emergency cleaning of outfall pipes).

Coordination/Communication: Weekly updates were faxed to the municipality to keep them informed of the current status of nesting activity and ENSP management recommendations. Additional communication between ENSP and City (PWD and BP) was ongoing throughout the season as needed. As already discussed, a mid-season meeting was held with the PWD to discuss both immediate and long-term management concerns with regards to nesting birds on the City’s beaches. ENSP staff presented a BNB orientation to BP in mid-June. At the request of the BP, a smaller and more informal format was used this year. Lifeguards that were assigned to stands within or close to the nesting areas were addressed in two small groups (rather than the entire lifeguard staff in a large formal setting).

Beach nesting bird management plan: A draft plan exists and has been used as a working plan between the City and ENSP for the last five years. The city has begun reviewing the plan with the aim of creating an updated version for approval.

Outreach: An interpretive sign was placed near the 23rd Street beach access. ENSP staff provided informal on-site outreach, including the distribution of BNB brochures to interested (and concerned) beachgoers.

Nesting results

Eight (8) pairs of piping plovers nested between 18th and 32nd Streets, resulting in 13 nesting attempts. Seven (7) nests hatched. Of the nests that failed, 3 were lost due to predation, 2 to flooding and 1 to abandonment. Predation by foxes from a den in the nesting area is suspected to be the cause of several of the nest failures. A total of 22 chicks hatched, of which 8 fledged.

A scattered least tern colony (19 maximum adults) was present in the area between 18th and 30th Streets. The colony completely failed, probably due to fox predation/harassment and possibly human disturbance.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: No change.

Predator exclosures: If fox continue to be a problem, consider the use of predator exclosures to protect nests nearest to the den (but only those nests that are well hidden from public view).

Predator control: Survey the beach in the winter to determine the updated status of fox den(s) before birds arrive. Work with the City and NJDFW Wildlife Control to assess options in managing the fox population, including trapping and removal.

Municipal beach management: Vehicle use by the City (primarily PWD and BP) in the nesting zone should continue to be limited to valid essential and emergency purposes during the nesting season. In particular, vehicle use of the 23rd Street vehicle access should continue to be curtailed, as was initiated in 2003. ENSP should continue to work with PWD and BP (as well as any other appropriate City departments) to educate them about how their activities can have a harmful effect on nesting birds. City cooperation in this regard has improved, however, compared to many other sites (municipalities) the volume of vehicle use is still very high. Public ORV usage is allowed in the early part of the season via the 23rd Street access. Strong consideration should be given to redirecting public vehicles outside the nesting area starting April 1 by only allowing public vehicle access from the 29th Street access to points south. This would be consistent with ENSP requests regarding vehicle usage by City workers. Young chicks were once again observed this season foraging at outfall pipes, therefore, cleaning of outfall pipes in nesting areas should continue to be curtailed during the nesting season, except in the event of an emergency. Catamaran owners were more cooperative this year and their activities did not appear to be significantly affecting nesting birds, even though their designated usage area at 23rd Street is in the middle of the nesting zone. Continue to monitor this carefully.

Coordination/Communication: No basic change. Direct communication between ENSP and the PWD increased after a mid-season meeting and should continue in the future.

Beach nesting bird management plan: ENSP and the City should update the Ocean City Beach Nesting Bird Draft Management Plan/Agreement with the goal of having it formally adopted by the City and approved by NJDEP and USFWS.

Outreach: No basic change, although ENSP should seek additional outreach opportunities within the City.

Corson's Inlet State Park

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff and CCRP student researchers monitored the site 3-5 times a week, including limited patrolling on at least 1 weekend day. NJDPF staff patrolled the Park daily.

Fencing/Posting: ENSP staff, WCC volunteers and Ocean City High School students prefenced (April 7) a large area at the southern end of the Park with string-and-post symbolic fence. A second strand of polypropylene rope was used as part of the fencing in order to provide additional protection. "Area Closed" signs were posted on every third post. A nest at the northern end of the Park was fenced by ENSP with string-and-post symbolic fence upon discovery. After the piping plover nest hatched, signs ("Nest Hatched", "5 MPH") were posted to alert beachgoers and Park staff of the presence of chicks. A defined feeding corridor could not be (effectively) established because the chicks moved around the site considerably.

Predator exclosures: A predator exclosure, supplemented with electric fence, was used on one nesting attempt. Exclosures were proposed for all nesting attempts, but other nests were destroyed almost as soon as they were found (prior to a full clutch).

Predator control: None undertaken.

Beach management: No active management of the beach is undertaken by NJDPF at this site. A boat and personal watercraft landing area, which is situated at the southern tip of the Park, results in disturbance to critical bird foraging area.

Coordination/Communication: Weekly updates were faxed to NJDPF to keep them informed of the current status of nesting activity and ENSP management recommendations. An on-site meeting was held between ENSP and NJDPF (including the new Superintendent) at the beginning of the nesting season to review BNB management at the Park.

Beach nesting bird management plan: No formal written plan.

Outreach: ENSP staff installed an interpretive sign at the northernmost end of the prefenced area (where a walking trail came out on the beach). ENSP staff provided informal on-site outreach, including distribution of BNB brochures to interested beachgoers.

Nesting results

Two (2) pairs of plovers nested at the site, resulting in 3 known nesting attempts. Two (2) nests were destroyed due to predation (likely fox). The remaining nest hatched 4 chicks, of which 1 fledged.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: No change. Continue to fence the southern portion of the Park prior to the nesting season and other nests as they are discovered.

Predator exclosures: If nothing is done to address the fox problems, it may be advisable to place exclosures on nests with fewer than 4 eggs, as nests were destroyed quickly at this site (before exclosures could be erected).

Predator control: Breeding habitat continues to be excellent at the Park, however, ENSP believes the fox population and associated predation pressure continue to suppress both the number of plovers attempting to nest at the site and the reproductive success of those that do nest. The fact that plovers shifted nesting to the northern end of the Park (after failing at the southern end) was likely the result of fox harassment. Furthermore, it is possible that black skimmers and least terns would nest at the Park if predatory threats were reduced. NJDPF and NJDFW should jointly develop a predator removal program that could include live trapping or temporary opening of the Park to licensed trappers during the regular trapping season.

Beach management: Vehicle use by NJDPF staff in the vicinity of foraging chicks should be limited to emergency and essential purposes only. Consideration should be given to relocating the boat/personal watercraft landing away from prime foraging habitat and possibly eliminating it from the Park entirely.

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: No change.

Strathmere Natural Area

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site 3 times per week, including limited patrolling on both weekend days. NJDPF staff also patrolled the site, although not on a regular basis.

Fencing/Posting: ENSP staff fenced a black skimmer colony with post-and-string symbolic fence once nesting activity was observed. “Nesting Bird” signs were posted on every other post.

Predator exclosures: No piping plovers nested at this site so exclosures were not necessary.

Predator control: None undertaken.

Beach management: This site is a state NA and, therefore, the beach is not actively managed. Vehicle usage was limited to occasional emergency usage. Boats and personal watercraft are permitted to land at the site. Local citizens placed "unauthorized" snow fence on the NA, including well out on the beach directly next to the nesting colony. ENSP staff removed the fence.

Coordination/Communication: Updates were faxed to NJDPF and NJONLM about once every two weeks to keep them informed of the current status of nesting activity and ENSP management recommendations. An on-site meeting was held between ENSP, NJDPF (including the new Superintendent) and NJONLM to review management of the site for nesting birds.

Beach nesting bird management plan: No formal written plan.

Outreach: A BNB brochure is permanently posted on the information kiosk located at the street entrance to the NA. ENSP staff conducted a limited amount of informal on-site outreach to interested beachgoers.

Nesting Results

No piping plovers nested at this site, although an unpaired male plover moved between this site and one directly south throughout the season.

A black skimmer colony (344 maximum adults) was present at the site. Among those birds that were observed nesting (only ~75 pairs) productivity was moderate (>0.5 to <1.0 fledges per pair). However, many birds were never observed nesting (no nests found), likely due to constant flooding and human disturbance.

Recommendations

Monitoring and patrolling: Increase the intensity of monitoring and initiate it in early April as the nesting habitat continues to improve and a piping plover was present at the site for much of this season. The success of the black skimmer colony was negatively impacted by human disturbances and ongoing vandalism to fencing, including from nighttime parties on the beach. With NJDPF assistance, find means to monitor and patrol these types of disturbances more effectively, including support from NJDFW Conservation Officers.

Fencing/Posting: A more protective type of fence (wire pasture fence) may be necessary if high levels of human disturbance and vandalism of sting-and-post symbolic fence continues. NJDPF should consider placing a sign(s) delineating the border between the NA and the Upper Township portion of the beach so that the public realizes they are entering a state owned NA (and that different regulations are in effect). "No Dog" signs at the border would also be beneficial since many people access the site from this direction.

Predator exclosures: Consider use of exclosures if plovers nest at this site, since avian (and likely mammalian) predators are frequently present.

Predator control: No basic change. However, dogs continue to be a problem (including from boats landing at the site). NJDPF more strictly enforced the dog regulations this year – these efforts should be continued.

Beach management: Human disturbance associated with the boat landing has been an ongoing problem for nesting birds using this site, especially in years when suitable nesting habitat is limited due to erosion. Elimination of the boat/personal watercraft landing area should be strongly considered since this is a state NA that should be managed primarily for nature, and secondarily for compatible human use. Furthermore, motorized boat usage is specifically not permitted under Natural Area System Rules and Statutes.

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: Placement of an interpretive sign on the beach would be beneficial if nesting occurs next year. Increase informal outreach with beachgoers through more intensive patrolling at the site, especially on weekends.

Strathmere Bay Island

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP monitored the site (via kayak) once every other week and occasionally more frequently from a nearby bridge.

Fencing/Posting: "Nesting Birds" signs were placed on posts around the perimeter of the northern end of the island. No string or rope was used.

Predator exclosures: No piping plovers nested at the site so exclosures were not necessary.

Predator control: None undertaken

Beach management: None – this is an undeveloped backbay marsh island.

Coordination/Communication: None.

Beach nesting bird management plan: No formal written plan.

Outreach: None

Nesting Results

No piping plovers nested at this site.

A black skimmer colony (62 maximum adults) was present at the site. The colony completely failed primarily due to several flooding events. Gulls (and possibly black-crowned night herons) nesting at the same site harassed the skimmers and may have directly predated eggs. Skimmers from the nearby colony at Strathmere NA were frequently observed loafing on this island, making it difficult to discern at which site the skimmers were actually nesting.

Recommendations

Monitoring and patrolling: No change

Fencing/Posting: No change.

Predator exclosures: Not necessary since this is not a piping plover nesting site.

Predator control: Although gulls (and possibly night herons) nesting at the site pose a predatory threat to nesting skimmers (eggs and chicks), predator control is not warranted because the nesting habitat is only marginally suitable and the site is always at a high risk of being flooded.

Beach management: No change

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: No change.

Strathmere (Upper Township)

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site 3-5 times per week, including limited patrolling on both weekend days.

Fencing/Posting: ENSP staff fenced two beach blocks with string-and-post symbolic fence as soon as focused piping plover nesting activity was observed. Once a nest was actually discovered within one of the fenced blocks, fence was removed from the other block. “Area Closed” signs were posted on every other post. After the piping plover nest hatched, a feeding corridor was created by posting signs (“Nest Hatched”, “5 MPH”) from the upper beach down to the intertidal zone in the area where chicks were feeding/resting.

Predator exclosures: A predator exclosure was used on the single piping plover nest at this site.

Predator control: None undertaken.

Municipal beach management: Upper Township does not mechanically rake any portion of their beach. Vehicle traffic was infrequent on the portion of the beach where nesting took place. Local residents (not the Township) erected dune fencing well out on the beach in several locations, including close to the nesting area.

Coordination/Communication: Weekly updates were faxed to the Township to keep them informed of the current status of nesting activity and ENSP management recommendations. Additional telephone communication between ENSP and the Township Engineer was necessary on several occasions to review management issues, primarily because this was the first time in several years that plovers nested in this area and the first year since a BNB management plan was developed.

Beach nesting bird management plan: A plan was prepared by Upper Township, but is still under review by NJDFW and USFWS-NJFO. In the interim, the plan is being used as the working agreement between ENSP and the Township.

Outreach: ENSP staff provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting Results

One (1) pair of piping plovers nested on the block between Whittier and Willard Streets, resulting in 1 nesting attempt. Three (3) chicks hatched from the nest, of which 1 fledged.

Recommendations

Monitoring and patrolling: Habitat is highly changeable at this site and no long-term nesting pattern has been established. As a result, careful and frequent monitoring of the entire stretch of beach is necessary.

Fencing/Posting: Prefencing is not recommended, however, fence should be erected by ENSP as soon as nesting activity is observed and territories seem well established (rather than waiting for actual nests to be found).

Predator exclosures: No change.

Predator control: Despite a local dog ordinance and the presence of "No Dog" signs at every beach access, dogs were frequently seen on the beach during the nesting season. On several occasions dogs were observed within the fenced nesting area and/or chasing plovers. Encourage the Township to better enforce their existing dog ordinance.

Municipal beach management: ENSP and the Township should work together to prevent local residents from erecting snow fence on the beach on an ad hoc basis. Such unauthorized dune fencing diminishes suitability of nesting habitat and when erected during the nesting season can cause disturbance to nesting birds.

Coordination/Communication: No change.

Beach nesting bird management plan: ENSP, USFW-NJFO and the Township should work to finalize and adopt the BNB management plan submitted by the Township last year.

Outreach: Consider the placement of an interpretive sign near the nesting area.

Townsend's Inlet (Sea Isle City)

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site at 3-5 times per week, including limited patrolling on both weekend days.

Fencing/Posting: ENSP staff prefenced (April 4) the area between 93rd Street and the Townsend's Inlet Bridge with string-and-post symbolic fence. A second strand of polypropylene rope was used as part of the fence in order to provide additional protection. "Area Closed" signs were posted on every third post. Feeding corridors were not necessary this year since the fenced nesting area extended nearly out to the intertidal zone. However, "Nest Hatched" and "5 MPH" signs were posted once piping plover nests hatched. The City posted large metal signs at either end of the fenced area outlining restrictions put in place as result of a City ordinance designating the area as a BNB area.

Predator exclosures: Two (2) piping plover nests were protected with a predator exclosure.

Predator control: None undertaken. However, ENSP asked the City to trap cats after several cats (and numerous tracks) were observed in the nesting area. The City's Animal Control Officer (via contract vendor) indicated that he could not trap because there was no shelter space available. The City was unwilling to pursue other animal control services to address the situation.

Municipal beach management: The City did not mechanically rake the area between 93rd Street and the Townsend's Inlet Bridge during the nesting season. Vehicle use was limited to essential and emergency uses only.

Coordination/Communication: Weekly updates were faxed to the City to keep them informed of the current status of nesting activity and ENSP management recommendations. Additional telephone communication was necessary with regards to cat problems.

Beach nesting bird management plan: No formal written plan exists, however the City has adopted an ordinance which designates the area between 94th Street and the Townsend's Inlet Bridge as a BNB area and outlines various public and municipal restrictions in the area.

Outreach: An interpretive sign was placed near the 94th Street beach access. ENSP staff provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting results

One (1) pair of piping plovers nested at the site, resulting in 2 nesting attempts. One (1) nest failed due to flooding. The other nest hatched 3 chicks, 2 of which fledged.

A small least tern colony (36 maximum adults) was present at the site. The colony abandoned the site in mid-June likely due to predation and harassment by cats. Portions of the colony were also flooded.

Recommendations

Monitoring and patrolling: Monitor areas just north of 94th Street on a more regular basis if suitable habitat remains.

Fencing/Posting: Encourage the City to construct larger "No Dogs" signs and/or place current "No Dogs" signs in more prominent locations since dogs are frequently seen on the beach. Some of the dog walkers access the beach from the Townsend's Inlet Park so signage at this location is necessary.

Predator exclosures: No change.

Predator control: Cats continue to be a severe problem although it is still not clear whether they are feral cats or pets let outside by nearby residents (or a combination of both). Several homeowners have indicated that a feral cat colony is being maintained by local residents at 86th Street (close enough to the nesting area to present a threat). All options need to be explored to lessen the threat of cats at the site, including the removal of cats/cat colonies. Work with the City to control the cat problem prior to and during the nesting season.

Municipal beach management: No change.

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: Consider distribution of "Cats Indoors" brochures to homeowners in the vicinity of the nesting area.

Avalon North

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff surveyed the site 3 times a week in the beginning of the season (April-May). A pair of plovers was observed in courtship and making nest scrapes just south of the jetty, however, no nesting occurred and eventually the pair left the site. After their departure, surveys were reduced to once a week until July when they were discontinued.

Fencing/Posting: No fence was erected at this site.

Predator exclosures: No piping plover nests were located so no exclosures were necessary.

Predator control: None undertaken.

Municipal beach management: As prescribed in detail in the BNB management plan, although no special consideration was necessary this year because nesting activity only lasted for several weeks early in the season. Some beach raking and non-essential vehicle use occurred at the site early in the season. ENSP requested that these activities be temporarily curtailed, which for the most part, they were.

Coordination/Communication: Weekly updates were faxed to the Borough to keep them informed of the current status of nesting activity and ENSP management recommendations. Direct contact with the Borough was initiated through the Public Works Director on an as-needed basis.

Beach nesting bird management plan: A plan signed by ENSP and the Borough has been in place since 2000.

Outreach: None undertaken.

Nesting results

No nesting occurred at the site.

Recommendations

Monitoring and patrolling: Continue to survey the site extensively in the early part of the season, even though no nesting occurred this year.

Fencing/Posting: Contact Avalon PWD to fence the area between 8th and 9th Streets (or other areas in the vicinity) as soon as focused nesting activity is observed (rather than waiting for a nest to be found).

Predator exclosures: Since predators have been a problem at this site, continue to use exclosures on all piping plover nests.

Predator control: If nesting birds return next year, contact the Borough immediately to remove cats.

Municipal beach management: Harassment due to vehicle use and/or beach raking may have been a factor in plovers leaving the site this year before nesting occurred. Continue to work with the Borough to limit vehicle access and use near 9th Street (or other nearby areas where nesting activity is detected).

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: Continue to work with the Avalon Environmental Commission to develop new outreach opportunities within the community.

Avalon Dunes

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff and CCRP student researchers monitored the site 3-5 times per week, including patrolling on both weekend days. CCRP students patrolled the area during the July 4th fireworks display.

Fencing/Posting: Avalon PWD prefenced 3 areas (40th - 44th Streets, 44th - 48th Streets and 48th – 50th Streets) in early April with sting-and-post symbolic fence. “Area Closed” signs were posted on every second post. The prefenced areas proved to be insufficient as piping plovers (and least terns) began nesting outside the fenced area, so the fence was expanded by ENSP staff as needed. ENSP staff also fenced 3 additional areas between 50th and 57th Streets with string-and-post symbolic fence as nests were discovered. Feeding corridors were not necessary this year since the fenced nesting area extended

nearly out to the intertidal zone. However, “Nest Has Hatched”, “Piping Plover Crossing” and “5 MPH” signs were posted once piping plover nests hatched.

Predator exclosures: Five (5) nests were protected with predator exclosures. Exclosures were used on nests close to the dunes or not otherwise protected by a least tern colony. CCRP student researchers assisted with the placement of exclosures.

Predator control: ENSP staff noted a high density of cat tracks in the nesting area, particularly between 40th and 48th Streets. After 3 nests were abandoned in that area, including 2 exclosed nests that had cat tracks encircling them, ENSP contacted the Borough to address the situation. The Borough contracted Tri-County Animal Control to trap cats in the dune area directly behind the nesting area. After 3 days of trapping, a total of 10 cats were removed and transported to animal shelters. ENSP believes the short period of trapping only had a limited effect, as tracks continued to be seen in the nesting area after the trapping.

Municipal beach management: The Borough closely followed all management guidelines prescribed in the BNB management plan, including limits on beach raking and vehicle use in the nesting area. In addition, the permanent relocation of the catamarans parking area between 44th – 48th Streets (to the south end of Stone Harbor) decreased the amount of human disturbance in the area.

Coordination/Communication: Weekly updates were faxed to the Borough to keep them informed of the current status of nesting activity and ENSP management recommendations. Direct contact with the Borough was initiated through the Public Works Director on an as-needed basis, including an early season meeting to review where PWD should place fencing. ENSP staff briefed Avalon BP in June (once all their seasonal staff was in place) regarding BNB issues.

Beach nesting bird management plan: A plan signed by ENSP and the Borough of Avalon has been in place since 2000.

Outreach: ENSP placed an interpretive sign on the beach at 40th Street. The Borough also placed interpretive signs at several beach accesses in or near the nesting zone. ENSP staff provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting results

Eight (8) pairs of piping plovers nested at this site, resulting in 12 nesting attempts. Four (4) nests hatched. Of the 7 nests that failed, 3 were lost to abandonment, 2 to predation and 2 to flooding. One (1) nest had an unknown outcome. A total of 12 chicks hatched, of which 6 fledged.

A least tern colony (213 maximum adults) was present early in the season between 40th and 48th Streets. After extensive failure due to flooding and predation (most likely by cats), a much smaller number of terns renested between 48th and 55th Streets. Productivity was low (<0.5 fledges per pair).

Recommendations

Monitoring and patrolling: More intensive monitoring of the area directly north and south of the "designated" nesting zone is needed as nesting activity continues to expand and habitat conditions are changing in this area.

Fencing/Posting: Extend the area that Avalon PWD prefences from 40th - 50th Streets to 40th – 57th Streets, since plovers have nested in this southern area the past two seasons. ENSP should meet on-site with PWD early in the season to review the area to be fenced. To help make the extra fencing as cost efficient and time saving as possible, the Borough could decrease the current pole density to make the same amount of poles go further. The Borough should replace the current type of string used with a more heavy-duty nylon coated style. This would allow the string to last longer and reduce the maintenance and re-stringing performed by ENSP staff throughout the season.

Predator exclosures: No change.

Predator control: Predators continue to be a concern, although the exact species causing problems have been difficult to determine. The 2003 season seemed to be plagued by cat problems. Implement nighttime monitoring at the site with night vision equipment so that predator species and patterns can be detected. Consider a trapping regime for cats earlier in the season and for a longer period of time.

Municipal beach management: Continue to work with the Borough to reduce beach raking near the nesting area. Nesting activity was observed between 35th and 38th Streets early in the season. Beach raking in this area may have altered nest site selection, so request that the Borough temporarily suspend raking if nesting activity is detected outside the "designated" areas.

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: Continue to work with the Avalon Environmental Commission to develop new outreach opportunities within the community. Explore the feasibility of ENSP participation in weekly beach walks conducted in Avalon by The Wetlands Institute.

Stone Harbor Point

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site 3-5 times per week, including patrolling on both weekend days. ENSP staff and volunteers patrolled the site during the July 4th fireworks display. Oceanfront portions of Stone Harbor's beach were surveyed on a regular basis early in the season by a monitor hired by USACE (and briefly trained by ENSP) to detect the presence of piping plovers in areas of ongoing beachfill-related construction.

Fencing/Posting: ENSP staff prefenced (April 15) all portions of the Point that were not prone to normal tidal flooding using string-and-post symbolic fence. The southwest corner of the CDF berm was also prefenced at the same time because piping plover nesting activity was detected in this area. “Area Closed” signs were posted on every third post. After piping plover nests hatched, “Nest Hatched” and “No Vehicle” signs were posted. “No Dog” signs were placed at the vehicle entrance in the parking lot, at the footpath entrance off of 3rd Avenue and next to the interpretive sign on the beach.

Predator exclosures: A predator exclosure was used on 1 nest after it lost an egg to an undetermined predator. Ultimately several other nests also experienced partial clutch reductions, but those nests were located within a dense colony of terns and skimmers making erection of exclosures unfeasible.

Predator control: None undertaken.

Municipal beach management: The Borough does not mechanically rake the beach at the Point. Stone Harbor BP was observed driving along the oceanfront portion of the Point on a regular basis, but the beach had become so wide that it was not close enough to any nesting to be considered a threat.

Coordination/Communication: Weekly updates were faxed to the Borough to keep them informed of the current status of nesting activity and ENSP management recommendations. An independent monitor that was required due to ongoing removal of materials from the CDF during the nesting season, also received the faxed updates. Additional on-site (and telephone) communication between ENSP and the independent monitor was ongoing throughout the season.

Beach nesting bird management plan: The Borough has completed a plan, which is still being reviewed by NJDFW and USFWS-NJFO. In the interim, the plan is being used as the working agreement between ENSP and the Borough.

Outreach: An interpretive sign was placed by ENSP at the end of the vehicle access path to the Point. ENSP staff provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers. ENSP presented a BNB program at the Wetlands Institute that was followed by a bird walk at the Point (in July). ENSP sent updates to New Jersey Audubon Society’s Cape May Bird Observatory, who posted the information onto their Natural History Hotline. ENSP staffed an information booth (with a BNB component) at the Wings and Water Festival.

Other: As part of a legal settlement with the federal government, the Borough placed approximately 4.4 acres of sand at the Point to restore nesting habitat that was eliminated as a result of the continued presence of the CDF at the site. ENSP worked with USFWS, USACE and the Borough to determine the best location/design for the restored nesting habitat. Ultimately, a large area about 150 years south of the CDF and a smaller area immediately west of the CDF were created just prior to the nesting season. The large area was utilized by 5 piping plovers and nearly all the nesting terns and skimmers. The small area hosted one piping plover nest. Overall, the new nesting areas attracted notably higher numbers of black skimmers and terns than in previous years. Although reproductive success was ultimately low for all species nesting at the Point and flooding was still one of the main causes, it is unlikely that any nests would have hatched at the

site this year if the new sand had not been placed there. NJDFW continued to work with all parties/agencies throughout the season to develop a restoration plan for the site once the CDF is finally removed.

Nesting results

Six (6) pairs of piping plovers nested at the site, resulting in 9 nesting attempts. Three (3) of the nests hatched. Five (5) nests were destroyed, including 3 to flooding and 2 to predation. The fate of 1 nest was undetermined since it disappeared close to the hatch date, but no chicks were ever seen. A total of 6 chicks hatched, of which 3 fledged. Notably, 5 of the 9 plover nests suffered clutch reductions (of up to 3 eggs) before they hatched or were totally destroyed. Gull predation is the suspected cause of the clutch reduction as they were observed carrying away tern eggs and chicks.

Both a least tern colony (257 maximum adults) and black skimmer colony (1337 maximum adults) were present at the site. The black skimmer colony was the largest in the state. Productivity for both least terns and black skimmers was low (<0.5 fledges per pair). Both species suffered nest and chick losses due to flooding and predation (by gulls). Least terns suffered the greatest losses, with nearly all the nests being destroyed before hatching.

Recommendations

Monitoring and patrolling: Survey the oceanfront portions of Stone Harbor's beach as a beach replenishment project completed last year has created potential nesting habitat.

Fencing/Posting: Continue to prefence any viable habitat at the Point in early April. The exact area to be fenced may depend on the status of the CDF, ecological restoration and ongoing natural changes to habitat at the Point. Fencing was completed by ENSP this year. ENSP should continue to take the lead role for now, but Borough involvement should also be encouraged since responsibility for prefencing will eventually be turned over to them under the conditions of the BNB management plan. Recruit volunteer assistance especially among the conservation groups (The Wetlands Institute and New Jersey Audubon Society) that frequently use this site for educational programs.

Predator exclosures: Continue to use on an as-needed basis, although more extensive use may be warranted because many piping plover nests suffered clutch reductions this year.

Predator control: Monitor the feral cat population at the Point to assess if removal (by the Borough) is necessary. The area is also likely populated by red fox, so populations and use of the beach habitat by fox should also be monitored. Gulls were observed removing common tern eggs and dead skimmer chicks from the site. They are likely responsible for some of the low productive success of all bird species nesting at the Point. Investigate the options available to deter gulls from the nesting area.

Municipal beach management: No change, unless nesting activity occurs on the oceanfront portion of the beach.

Coordination/Communication: No change.

Beach nesting bird management plan: Continue to work with the USFWS-NJFO and the Borough to finalize and formally adopt the BNB management plan submitted by the Borough.

Outreach: Continue to expand outreach efforts in the community, especially through continued partnership with The Wetland Institute. Stone Harbor Point hosts one of the most spectacular concentrations of beach nesting birds in the state, and as such would make an ideal location for ENSP seasonal monitors to offer guided "nature tours".

North Wildwood (Hereford Inlet)

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site 3-5 times per week, including patrolling on both weekend days. ENSP staff and volunteers patrolled the site during the July 4th fireworks display.

Fencing/Posting: ENSP staff prefenced (April 23) two areas along the inlet between Surf Road and Central Avenue with string-and-post symbolic fence. A second strand of polypropylene rope was used on the back side of the fence to provide additional protection. "Area Closed" signs were placed on every second pole. A semi-permanent tidal pond that exists at the back of the beach served as the primary foraging area for the chicks (and adults). Municipal vehicle access to this area was entirely restricted by posting "No Vehicle" signs at the back of either end of the nesting area. After piping plover nests hatched, signs ("Nest Hatched") were also posted to alert beachgoers walking through this foraging area. In addition, "5 MPH" and "Nest Hatched" signs were posted along the inlet side of the nesting area.

Predator exclosures: No predator exclosures were used at this site.

Predator control: None undertaken.

Municipal beach management: At ENSP's request**,** the City did not mechanically rake the area along the inlet between Surf Road and Central Avenue during the nesting season. ENSP requested that municipal vehicle use in this area be limited to essential and emergency uses only.

Coordination/Communication: Weekly updates were faxed to the City to keep them informed of the current status of nesting activity and ENSP management recommendations.

Beach nesting bird management plan: No formal written plan.

Outreach: An interpretive sign was placed at the eastern end of the fencing (where the most public usage was anticipated). ENSP staff provided informal on-site outreach, including the distribution of BNB brochures to interested beachgoers.

Nesting Results

Three (3) pairs of piping plovers nested at this site, resulting in 5 nesting attempts. Two (2) nests were destroyed due to flooding and 1 nest was destroyed by an avian predator. Two (2) nests hatched a total of 5 chicks, of which 4 fledged.

A least tern colony (490 xaximum adults) was present at the site. It was the largest least tern colony in the state. Productivity was moderate ($\geq$ 0.5 to >1.0 fledges per pair), despite problems with flooding and avian predation (peregrine falcon).

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: The beach receives heavy public use and human encroachment within the fenced nesting area continues to be a problem. String-and-post symbolic fence may still be sufficient but pole density should be increased and a second strand of string/rope should be used around the entire perimeter of the nesting area.

Predator exclosures: No change.

Predator control: Encourage the City to better enforce their existing dog ordinance since dogs (both leashed and unleashed) continue to be a problem at this site.

Municipal beach management: Continue to closely monitor beach raking directly east of the fenced nesting area. If chicks utilize this area, raking should be curtailed or a larger (fenced) buffer established. The amount of municipal vehicle use in front of the nesting area (on inlet side) was excessive, especially considering that there appears to be limited need for travel in this area. Work with the City to reduce their vehicle use to valid essential and emergency usage only.

Coordination/Communication: No basic change. However, education of municipal staff (including PWD, BP and PD) regarding potential negative impacts of their activities on nesting birds needs to be initiated.

Beach nesting bird management plan: A management plan will be necessary as a permit condition of any upcoming USACE beachfill or bulkhead projects. Work with the City to initiate development of a BNB management plan that encompasses this site, as well as oceanfront portions of the beach.

Outreach: Consider placement of an interpretive sign at both ends of the nesting area as public access is heavy from both directions.

US Coast Guard - Loran Support Unit (LSU)

BNB Site Manager: USFWS - Cape May NWR
Summary provided by: USFWS – Cape May NWR

Management

Monitoring and patrolling: NWR staff monitored the site 2-3 times per week.

Fencing/Posting: NWR officials closed the adjacent refuge beach to all activities during the entire nesting season and limited use of their trail system leading to the USCG-LSU

beach to people engaged in wildlife related activities such as fishing and wildlife observation. The USCG-LSU beach was open to all base personnel and security staff. USCG-LSU staff prefenced the area directly next to Cold Spring Jetty. NWR staff used string-and-post symbolic fence along with "Beach Nesting Bird" signs on other areas of the beach once nests were observed. Fencing extended almost to the high tide mark, but left enough room for security vehicles to pass by during high tide.

Predator exclosures: No predator exclosures were used at the site.

Predator control: None undertaken.

Beach management: Beach management activity throughout the nesting season consisted of routine daily patrols by USCG-LSU security vehicles and establishment of two parallel snow fence units placed perpendicular to the existing dunes in order to accommodate ingress and egress to the beach by USCG-LSU security vehicles and staff. Some sand movement by wheeled tractors was conducted to bolster the snow fence and for sign maintenance.

Coordination/Communication: Communication was maintained between ENSP and NWR staff and between NWR staff and USCG-LSU throughout the nesting season via telephone, email and personal on-site conversations.

Beach nesting bird management plan: No formal written plan.

Outreach: None undertaken.

Nesting Results

Two (2) pairs of plovers nested at the site, resulting in 4 nesting attempts. Two (2) nests hatched and 2 were destroyed due to flooding. A total of 7 chicks hatched, of which 1 fledged.

A small least tern colony (41 maximum adults) was present at the site, primarily at the southern end of the beach near the inlet jetty. Productivity was low (<0.5 fledges per pair). Aside from some flooding, the exact causes of this low productivity were unknown. However, the following could have been contributing factors: predation after eggs were hatched and beach management activities (i.e. vehicle use).

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: Prefence appropriate habitat in early April before nesting occurs.

Predator exclosures: Predator exclosures should only be used after a predator problem is observed.

Predator control: Continue to survey the area for predators as well as the ghost crab population, as specific predator species have been difficult to determine. Consider nighttime and/or video monitoring of the site.

Beach management: USCG-LSU staff and contractors should closely follow guidelines outlined in the USFWS's Piping Plover Recovery Plan. Vehicle use should be limited to emergencies and valid essential use. A yearly information session is recommended for USCG-LSU staff and security personnel regarding potential negative impacts of their activities on beach nesting birds. The snow fence placed for ingress and egress to accommodate USCG-LSU security and staff should be removed as it is degrading habitat in an area that has historically and recently supported nesting piping plovers (and least terns).

Coordination/Communication: Coordination between USCG-LSU, USFWS-Cape May NWR, USFWS-NJFO and NJDFW-ENSP should increase regarding beach management activities at the site.

Beach nesting bird management plan: USCG-LSU should develop a written management plan consistent with the USFWS "Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitat on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act" document.

Outreach: USCG-LSU staff and seasonal employees should receive annual BNB orientation.

Other: Create a written agreement between USCG-LSU and USFWS-Cape May NWR regarding responsibilities for management, monitoring and protection activities.

US Coast Guard Training Center (TRACEN)

BNB Site Manager: NJDFW-ENSP and USCG
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored the 3-5 times per week, including limited weekend patrolling, through a combination of ENSP staff and the USCG (Environmental Officer and his assistant). USCG also patrolled the site for security purposes.

Fencing/Posting: As has been the case in recent years, USCG closed the beach to all base personnel (except security staff) during the entire nesting season, and to reinforce the closure USCG staff prefenced the back portion of the beach with string-and-post symbolic fence. The beach is also closed to the public and to prevent any public trespassers from wandering into the nesting area, USCG staff prefenced most of the shoreline just above the intertidal zone with string-and-post symbolic fence. "Area Closed" signs were placed on every second post. USCG staff also installed a large "Beach Closed" sign at the base's southern border in an attempt to further reduce unauthorized public access.

Predator exclosures: USCG and ENSP staffs jointly erected 2 predator exclosures at the site. Exclosures were considered for the 2 other nests found at the site, but the nests were destroyed just before exclosures were scheduled to be erected.

Predator control: Because mammalian predators (fox, cats and raccoons) are believed to be partially responsible for nest failures and chick loss at the site in recent years, USCG continued its predator removal program. Removal was conducted for about a two month period in the spring by the U.S. Department of Agriculture – Animal and Plant Health Inspection Service.

Beach management: No active beach management, including beach raking, is conducted by USCG at the site.

Coordination/Communication: Regular communication was maintained between ENSP and USCG via telephone, e-mail and on-site visits with the base's Environmental Officer.

Beach nesting bird management plan: USCG has developed a BNB management plan as part of their Integrated Natural Resources Management Plan and Environmental Assessment.

Outreach: None undertaken.

Nesting Results

Four (4) pairs of piping plovers nested at the site, resulting in 4 nesting attempts. Two (2) nests hatched. Two (2) nests were destroyed by predators (1 avian and 1 undetermined species). A total of 4 chicks hatched, of which 3 fledged.

Recommendations

Monitoring and patrolling: No change.

Fencing/Posting: No change.

Predator exclosures: No change – exclosures should continue to be considered for all piping plover nests.

Predator control: USCG should continue the predator removal program that has been in place for the last 3 years. Better assessment of the impact of avian predators on nesting success is needed.

Beach management: No change.

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: No change.

Other: Continue to encourage the USCG to take the lead role in management and monitoring of the site, although ENSP and USCG should continue to share management responsibilities.

Cape May City

BNB Site Manager: NJDFW-ENSP
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: ENSP staff monitored the site 2-3 times per week, including limited patrolling on 1 weekend day.

Fencing/Posting: ENSP staff protected a least tern colony with string-and-post symbolic fence once nesting activity was observed. "Area Closed" signs were placed on every third post.

Predator exclosures: No piping plovers nested at this site so exclosures were not necessary.

Predator control: None undertaken.

Municipal beach management: At ENSP's request, municipal vehicle use on the Poverty Beach section (Wilmington Avenue to USCG base) was limited to emergency and essential uses only for the entire nesting season. Beach raking was suspended from Baltimore Avenue to the USCG base in the early part of the season, but these restrictions were lifted (except for the Poverty Beach section) at of the end of June once no nesting activity was observed in this area.

Coordination/Communication: Updates were faxed to the City about every other week to keep them informed of the current status of nesting activity and ENSP management recommendations. At the City's request, an on-site meeting was held late in the season to discuss nesting status and management issues (particularly beach raking restrictions).

Beach nesting bird management plan: A plan was submitted by the City, but is still under review by NJDFW and USFWS-NJFO. In the interim, the plan is being used as the working agreement between ENSP and the City.

Outreach: None.

Nesting results

No piping plovers nested at the site.

A least tern colony (66 maximum adults) was present on the Poverty Beach section of the City's beach. Productivity was moderate ($\geq$0.5 to >1.0 fledges per pair).

Recommendations

Monitoring and patrolling: Although no piping plovers nested at the site this year, continue to closely monitor the entire northern portion of the city's beach (Baltimore Avenue to the USCG base) for the presence of nesting activity early in the season.

Fencing/Posting: No change. Continue to fence areas only after nesting activity is discovered.

Predator exclosures: Since predator activity is very high at this site, consider use of predator exclosures if plovers nest in the future.

Predator control: The City has instituted a trap, neuter and release (TNR) program to deal with its feral cat problem. Work with the City to make sure none of the colonies are located near known nesting areas and that this program is consistent with BNB goals and endangered species regulations. Encourage the City to enforce their existing dog ordinance as dogs continue to be a problem at this site in the early morning and evening hours.

Municipal beach management: The Poverty Beach section of the City should be designated as a "no-rake" zone year-round (except for some occasional maintenance "cleaning" of the beach prior to or after the nesting season).

Coordination/Communication: All appropriate City officials (other than just those in PWD) should receive regular faxed updates.

Beach nesting bird management plan: Work with the USFWS-NJFO and the City to finalize and formally adopt the BNB management plan submitted by the City. The plan needs to be updated to address the City's implementation of a local TNR program to deal with feral cats.

Outreach: More outreach should be undertaken in the City in general, but in particular focusing on residents that live near the nesting area at Poverty Beach.

Other: The Poverty Beach Club, a private club located on the northernmost 100 yards of the "City's" beach, independently manages "their" beach. Management of the beach, which includes frequent beach raking, is not conducive to nesting birds. Because the beach receives regular renourishment as part of a federal (USACE) project and is directly between two areas that have supported nesting birds in recent years, management of this beach needs to be addressed either in the City's BNB management plan or in some other manner that will be acceptable to ENSP and the appropriate federal agencies (USFWS, USACE).

Cape May Meadows – TNC

BNB Site Manager: TNC – Delaware Bayshores Office
Summary provided by: Les Frie, Stewardship Coordinator, TNC

Management

Monitoring and patrolling: The Cape May Meadows were monitored and patrolled daily by TNC Staff and a seasonal intern.

Fencing/Posting: The nesting area from Mt. Vernon Avenue to the Cape May Point State Park boundary line was prefenced with "T" posts and two strands of nylon rope (one high and one low). A sign was placed on every fifth post. The signs used were the state-issued "Area Closed - Endangered Birds Nesting" and TNC's "Bird Nesting Area - Please Do Not Enter". At every entrance to the preserve there were also signs posted. A large sign with preserve rules was posted on the beach facing Mt. Vernon Avenue.

Predator exclosures: Exclosures were used on every nest, due to the high predation rate from crows in previous years.

Predator control: None.

Beach management: None.

Coordination/Communication: TNC and the Park were in communication throughout the season regarding the location of plover chicks. This was, in part, due to the use of ORV's by the Park.

Beach nesting bird management plan: No formal written plan.

Outreach: Monitors (paid staff and/or volunteers) were present on-site on a daily basis to educate the public. An information kiosk is located in the TNC parking lot and a BNB interpretive sign is located at the main beach access path.

Nesting Results

Two (2) piping plover pairs produced four fledglings on the TNC portion of Cape May Meadows. This was the most productive year in the last 6 years, possibly due to inclement weather in the first two months of the season that reduced human activities.

A least tern colony (34 maximum adults) was present at the site. Production was low (<0.5 fledges per pair) due to undetermined reasons.

Recommendations

Monitoring and patrolling: No change

Fencing/Posting: No change

Predator exclosures: No change

Predator control: No change

Beach management: No change

Coordination/Communication: No change.

Beach nesting bird management plan: No change.

Outreach: No change.

Cape May Point State Park

BNB Site Manager: NJDFW-ENSP and TNC
Summary provided by: NJDFW-ENSP

Management

Monitoring and patrolling: The site was monitored at least 3 times a week, including limited patrolling on weekends, through the combined efforts of ENSP and TNC (as part of their regular monitoring of the adjacent TNC-owned beach).

Fencing/Posting: The portion of the Park beach directly adjacent to TNC was prefenced (May 1) with string-and-post symbolic fence as soon as focused piping plover nesting activity was observed. Fencing was completed as a cooperative effort between ENSP, TNC and Park staff. "Area Closed" signs were placed on every third post. After the piping plover nest hatched, a feeding corridor was created by posting signs ("Nest Hatched", "5 MPH") from the upper beach down to the intertidal zone in the area where chicks were feeding/resting.

Predator exclosures: The single piping plover nest at this site was protected with a predator exclosure, jointly erected by ENSP and TNC.

Predator control: None undertaken.

Beach management: At ENSP's request, Park staff discontinued all but emergency and essential vehicle use on the portion of the Park beach closest to the TNC property when unfledged piping plover chicks were present (including broods originating from either the TNC or Park portions of the beach).

Coordination/Communication: Updates were faxed to the Park and TNC about every other week to keep them informed of the current status of nesting activity and ENSP management recommendations.

Beach nesting bird management plan: No formal written plan.

Outreach: None.

Nesting Results

One (1) pair of piping plovers nested at the site, resulting in 1 nesting attempt. The nest hatched a total of 3 chicks, of which 1 fledged. The Park was also used as a foraging and resting area by a brood of chicks (and associated adults) that hatched from the TNC portion of the beach.

A least tern colony (10 maximum adults) was present at the site. The colony completely failed due to undetermined reasons.

Recommendations

Monitoring and patrolling: ENSP and TNC have shared monitoring of the site in recent years, although specific responsibilities for each party have not been formalized. Work with TNC to advance the partnership. Also see **Coordination/Communication** below.

Fencing/Posting: Fencing of the section of Park beach closest to the TNC property should be completed prior to the nesting season (~ April 1) rather than waiting until nesting activity is detected, as piping plovers and/or least terns have now used the same portion of the beach for the last several years. Consider erecting fence the same day as TNC schedules fencing on their beach. Elicit assistance from Park staff for fencing project.

Predator exclosures: No change.

Predator control: A predator control program should be implemented.

Beach management: Vehicle use by Park staff should be limited to essential vehicles only and to the area near the intertidal zone starting April 1. Once chicks are present on the beach, vehicle use should be further restricted to only valid emergency situations.

Coordination/Communication: A meeting with all appropriate staff from ENSP, TNC, and the Park should be held prior to the season to discuss the long-term management of the site, including who should be responsible for the various aspects of management. In addition, ENSP should meet annually with the Park staff, including seasonal employees, for an orientation on nesting birds. The main focus of this meeting would be how Park

staff activities potentially have detrimental effects on nesting birds, but it could also be used to help the Park develop and implement BNB outreach.

Beach nesting bird management plan: No change.

Outreach: ENSP should provide the Park with BNB brochures to distribute at the Visitor's Center. Encourage the Park to develop outreach programs that have a BNB component. An interpretive sign should be placed at the site during the nesting season.