# APPENDIX M

# DRAFT FISH AND WILDLIFE COORDINATION ACT REPORT

# PRELIMINARY DRAFT FISH AND WILDLIFE COORDINATION ACT 2 (b) REPORT
# FIRE ISLAND INLET TO MONTAUK POINT
# REFORMULATION STUDY PROJECT

**Prepared for:**
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**New York, New York**

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## EXECUTIVE SUMMARY

This preliminary Draft Fish and Wildlife Coordination Act Report (DFWCAR) is provided at the request of the U.S. Army Corps of Engineers (Corps) towards fulfillment of Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*).

The purpose of the FWCA is to assure equal consideration and coordination of fish and wildlife conservation with other project purposes. This DFWCAR provides the Service comments on the biological and procedural issues relevant to the Corps' Fire Island Inlet to Montauk Point, Reformulation Study Project (FIMP). Section 2(b) of the FWCA requires that the final report of the Secretary of the Interior: (1) determine the magnitude of the direct, indirect, and cumulative impacts of the proposed projects on fish and wildlife resources, and (2) make specific recommendations as to measures that should be taken to conserve those resources.

The Corps provided a project description in their August 10, 2015, correspondence, and in their Draft Environmental Impact Statement (DEIS) (U.S. Army Corps of Engineers 2016a) and Draft General Re-Evaluation Report (DGRR) of April, 2016 (U.S. Army Corps of Engineers 2016b). The Corps had indicated that the Tentatively Selected Plan (TSP) design in their August 10, 2015, correspondence was at a 15 percent design level of completion. It is not clear what the design level is in the current DEIS and DGRR. The Service continues to review these documents at this time, requesting additional detail as needed and providing recommendations. As a result, this draft does not, at this time, constitute the final report of the Secretary of the Interior as required by section 2(b) of the FWCA.

The TSP, as proposed, would have both short and long-term impacts to fish and wildlife resources which, as proposed, are not adequately mitigated, thus would result in a net loss for natural/fish and wildlife resources. In addition, we encourage the Corps to fully incorporate ecosystem services analyses into the decision making process as per the Presidential Memorandum M-16-01.

Among the impacts, the Corps' preferred project will have both direct and indirect adverse impacts on fish and wildlife resources and their supporting ecosystems. Initial beach fill will directly impact subaerial, nearshore intertidal, and subtidal marine habitats and subaqueous borrow areas. These impacts include burial of benthic organisms, turbidity, and modification of habitats.

In the long-term, the beach fill/dune construction plan will have cumulative impacts extending after the end of the nourishment project, causing adverse impacts on fish and wildlife habitat and the overall condition of the barrier island through reduction in the frequency and magnitude of coastal sediment processes which maintain the barrier islands as natural protective features. These coastal processes contribute to barrier island resiliency which contributes to the protection of Long Island's south shore from direct influences of ocean waves and also create and maintain a natural balance among various terrestrial and estuarine habitat types, vegetation cover types, and fish and wildlife species.

The best available science does not support the concept that closing or preventing all breaches and overwashing of the barrier island will provide benefits to shorebird populations. The DEIS indicates that overwash habitats are optimal habitats for the federally-listed species in the study area, which is well known from research spanning back to the late 1980s (Patterson 1988; Loergering and Fraser 1995; Elias-Gerken *et al.* 2000; Cohen *et al.* 2009); however the TSP does not evaluate or propose alternatives that would allow for the formation of these habitats except for within a limited area within the Fire Island National Seashore (FIIS).

Apart from the small-scale restoration of wetlands targeted for the mainland, proposed as coastal process features, there does not appear to be any substantial, landscape level evaluation of wetland restoration opportunities for mainland marshes. Accordingly, additional coordination during subsequent planning, engineering, design, and construction phases of the project will be required.

Breaching and overwashing are critical to the long-term resiliency of the barrier islands and wetland growth and sustainability and yet cross island sediment transport is not proposed as a key element of the project. We continue to recommend that the Corps develop a comprehensive breach management plan which includes alternatives that address the importance and benefits of barrier island breaching and overwashing (cross island sediment transport), and evaluate plans that achieve these benefits.

The FIMP should be consistent with the recent Presidential directive entitled, “Mitigating Impacts on Natural Resources From Development and Encouraging Related Private Investment” (Federal Register Vol. 80, No. 215; Friday, November 6, 2015). Accordingly, “Agencies’ mitigation policies should establish a net benefit goal or, at a minimum, a no net loss goal for natural resources the agency manages that are important, scarce, or sensitive, or wherever doing so is consistent with agency mission and established natural resource objectives. Additionally, the proposed coastal process features do little to mitigate for the impacts of the TSP and the Service recommends additional features be designed to address these impacts. Due to the above referenced issues, the Service has concerns regarding the TSP as described in this DFWCAR. We will continue to work with the Corps to resolve them.

Finally, this report does not constitute a Biological Opinion under Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.). A detailed discussion of the impacts of the proposed project on the federally-listed threatened piping plover (*Charadrius melodus*; threatened), red knot (*Calidris canutus rufa*; threatened), roseate tern (*Sterna dougallii dougallii*; endangered), and seabeach amaranth (*Amaranthus pumilus*; threatened) will be addressed in the Service’s forthcoming Biological Opinion. The Service will also be providing additional comments within the Department of the Interior’s consolidated comments on broader issues pertaining to the GRR and DEIS.

# I. PROJECT PURPOSE, SCOPE, AND AUTHORITY

The Fire Island Inlet to Montauk Point (FIMP), NY, Combined Beach Erosion Control and Hurricane Protection Project (Location depicted in Figure 1) was originally authorized by the River and Harbor Act of 14 July 1960 in accordance with House Document (HD) 425, 86th Congress, 2nd Session, dated 21 June 1960, which established the authorized overall FIMP project. The authorized project provides for beach erosion control and hurricane protection along five reaches of the Atlantic Coast of New York from Fire Island Inlet to Montauk Point by widening the beaches along the developed areas to a minimum width of 100 feet (ft), with an elevation of 14 ft above mean sea level, and by raising dunes to an elevation of 20 ft above mean sea level, from Fire Island Inlet to Hither Hills State Park, at Montauk and opposite Lake Montauk Harbor. This construction would be supplemented by grass planting on the dunes, by interior drainage structures at Mecox Bay, Sagaponack Lake, and Georgica Pond and the construction of up to 50 groins, and by providing for subsequent beach nourishment for a period of ten years, as amended.

This authorization has been modified by section 31 of the Water Resources Development Act (WRDA) of 1974 (Public Law [PL] 93-251), and sections 103, 502, and 934 of the WRDA of 1986 (PL 99-662), which principally impact cost-sharing percentages and the period of renourishment. The project is also presented in this report considering the cost-sharing provisions within PL 113-2 of January 29, 2013, Disaster Relief Appropriations. The initial construction cost in accordance with the provisions of PL 113-2 is 100 percent federal. PL 113-2 states that "the completion of ongoing construction projects receiving funds provided by this division shall be at full Federal expense with respect to such funds.

The authorized project was developed and implemented along five reaches. These reaches are used in the description of the implementation of the project, and are as follows:

Reach 1 – Fire Island Inlet to Moriches Inlet (FIMI)
Reach 2 – Moriches Inlet to Shinnecock Inlet
Reach 3 – Shinnecock Inlet to Southampton
Reach 4 – Southampton to Beach Hampton
Reach 5 – Beach Hampton to Montauk Point"

A portion of the FIMP project was built between 1965 and 1970 when 15 groins plus beach fill were constructed in Westhampton Beach and two groins were constructed in the vicinity of Georgica Pond in Southampton.

<u>Reformulation of Authorized Plan: 1977 EIS Council on Environmental Quality Referral</u>

As stated in the introduction, the FIMP is being reformulated both in response to earlier recommendations from the President's Council on Environmental Quality (CEQ) and in fulfillment of the Corps' Engineering Regulation 1105-200-2. An Environmental Impact Statement (EIS) for the FIMP project was previously released by the Corps in 1977 that proposed work in the area west of Shinnecock Inlet as depicted in Figure 3. Subsequently, the DOI, in conjunction with the U.S. Environmental Protection Agency (USEPA) and the National Oceanic and Atmospheric Administration/Fisheries (NOAA/F), referred the final EIS to the President's CEQ based on their findings that the document inadequately addressed systemic environmental impacts, including impacts to the future condition of the barrier islands, and failed to evaluate all reasonable alternatives. The CEQ informed the Corps that the EIS was "environmentally unacceptable and that the Corps has not demonstrated that there are no practicable alternatives available." The CEQ also stated, "Because the entire project area is a system, it would be disingenuous to treat these issues solely in connection with a particular segment of the shore." The CEQ concluded with the recommendation that "the Corps revise its overall project plan to create an adequate framework within which subsequent detailed planning for specific parts--or reaches--might occur." That is, reach by reach planning was to follow an overall understanding of the environmental consequences of the proposed project, not to precede them.

In response to the CEQ decision, the Corps proposed a plan of study for project reformulation in 1980. However, that effort was suspended until the early 1990s due to cost sharing issues between the state of New York (State) and the Corps.

## II. RELEVANT PRIOR AND ON-GOING STUDIES/REPORTS/FEDERAL PROJECTS

### A. Federal Projects

Additional proposed or constructed federal projects within the FIMP project area are described below. As per the National Environmental Policy Act (NEPA), these actions should be considered in the Corps' cumulative effects analysis for the proposed project.

1. Fire Island Inlet to Moriches Inlet Fire Island Stabilization Project (FIMI)

The Corps' FIMI project is an engineered dune and beach system which is planned for 19 miles (mi.) of Fire Island's beaches (U.S. Army Corps of Engineers 2014a). The proposed project includes dredge material placement in existing overwash habitat in the project area (Figure 2). It will also prevent the formation of new overwash habitats. The project will occur in many breeding and growing areas for endangered species, and will result in significant short and long term changes to their nesting, foraging, and chick rearing habitats. The volume of sand in the proposed project, approximately 7,000,000 cubic yards (cy), would represent the largest single project ever construction on Fire Island and would be accomplished at a full federal cost of about $185,000,000 (U.S. Army Corps of Engineers 2013 [LRR Report]). Sand for dune and beach construction would be obtained from designated offshore sand mining areas. The construction schedule would entail continuous dredging, sand placement, dune building, and beach construction over 2 consecutive years.

Refer to the Corps' Limited Re-Evaluation Report (U.S. Army Corps of Engineers 2013) for a more detailed description of the FIMI project.

A detailed discussion of the impacts of the FIMI on the federally-listed piping plover (*Charadrius melodus*; threatened), roseate tern (*Sterna dougallii dougallii*; endangered), and the seabeach amaranth (*Amaranthus pumilus*; threatened) were transmitted to the Corps as a Biological Opinion on May 23, 2014. A detailed discussion of the impacts of the FIMI on other fish and wildlife resources were transmitted to the Corps as a FWCA Report on June 18, 2014 (U.S. Fish and Wildlife Service 2014).

2. National Park Service Fire Island National Seashore New York's Wilderness Breach Management Plan/EIS

The National Park Service (NPS) Fire Island National Seashore (FIIS) is in the process of determining if the breach in the Otis Pike Fire Island High Dune Wilderness Area, opened during Superstorm Sandy, should be closed. FIIS is preparing an EIS to assist in the decision making process. The EIS will evaluate the following initially identified alternatives: leave the breach open and managed under natural conditions; close the breach; leave the breach open and establish procedures for closing the breach if certain conditions occur; stabilize the breach to provide a permanent inlet. The decision making process is currently in the scoping phase. FIIS is reviewing the public comments and plans on completing the draft EIS and having it available for public review in the summer of 2016 (National Park Service 2015).

3. 30-year Westhampton Interim Storm Damage Protection Project

Initial construction of the Westhampton Interim Project was initiated and completed in the Summer of 1996 and the Fall of 1997, respectively. This project followed a breach during the Winter of 1992 and 1993. Initial construction entailed beach fill/dune construction over 21,460 ft of beach and the realignment of the two western most groins of the 15 groins that were constructed between 1965 and 1970. Over 4,480,000 cy of sand were dredged from offshore borrow areas to complete the initial phase. Renourishment of the design profile will occur on an average of every 3 years, initially requiring 981,000 cy and approximately 1,179,000 cy for each renourishment thereafter. Refer to the Corps' website (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/487483/fact-sheet-fire-island-to-montauk-point.aspx) for a detailed description of the project.

4. Breach Contingency Plan (BCP)

In addition to the larger scale, longer term, interim proposals and projects, the Corps and other interested Federal, State, and local governments developed the BCP for the 50 mi. of barrier beach (Fire Island Inlet to Southampton Barrier Spit) within the FIMP Reformulation Study area for the purpose of closing breaches in an expedited manner. The Biological Opinion for the BCP has expired and the Corps is required to reinitiate Section 7 of the Endangered Species Act (ESA) consultation in order to lawfully continue to implement this plan.Breach response is a component of the FIMP and will be reassessed in the biological opinion for the currently proposed project.

In October of 2012, Superstorm Sandy created three breaches and extensive overwash areas on the eastern end of Fire Island. Three breaches formed on Fire Island at Smith Point (40.750156N, -72.811806W), Old Inlet (40.723509N, -72.894704W), and eastern Fire Island Pines (40.667489N, -73.055264W). Based upon Service personnel observations, the breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide, but was closed by the Corps under the provisions of the Corps' BCP in December of 2012. The breach at Old Inlet remains open and options concerning its management are being explored by the NPS in accordance with the Fire Island Wilderness Act of 1983 (Public Law 95-585) and NEPA. The breach at eastern Fire Island Pines did not require any action under the Corps' BCP as no exchange of bay and ocean water was observed after the storm passed and tidal levels subsided.

5. Fire Island Inlet Federal Navigation Project authorized in 1948 and Shore Westerly Project (Corps; Active)

DESCRIPTION: This is a multi-purpose project that provides navigation and shore protection benefits through the periodic maintenance dredging of Fire Island Inlet with placement of dredged sand along the shoreline several miles west of the inlet at designated barrier island's critical erosion area [Gilgo Beach]. The sand placed at Gilgo is intended to nourish the westerly beaches and provide storm damage protection.

Refer to the Corps' web site: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/10863/fact-sheet-fire-island-inlet-and-shores-westerly-to-jones-inlet-new-york.aspx) for a more detailed description of the project..

6. Long Island Intracoastal Waterway, New York-Federal Navigation Channel

Authorization/Project Description: The Rivers and Harbors Act of August 26, 1937 authorized the Long Island Intracoastal Waterway Federal Navigation Project. The existing project provides for a navigation channel 6 ft deep, 100 ft wide from the Federally-improved channel in Great South Bay, opposite Patchogue, to the south end of Shinnecock Canal. The lengthy 33.6-mi. project traverses the inland waters through the Great South Bay, the Bellport Bay, the Narrow Bay, the Moriches Bay, the Quantuck Bay and the Shinnecock Bay.

Refer to the Corps' web site: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/9192/fact-sheet-long-island-intracoastal-waterway-new-york-federal-navigation-channel.aspx) for a detailed description of the project.

7. Moriches Inlet Navigation Project

Authorization/Project Description: The Moriches Inlet Project was authorized by the Rivers and Harbors Act of 1960 and the 1985 Supplemental Appropriation Act. The existing Moriches Inlet Federal Navigation Project provides for a channel, 10 ft deep, 200 ft wide, extending from that depth in the Atlantic Ocean to Moriches Bay, at a length of approximately 0.8 mi., and a channel, 6 ft deep, 100 ft wide, to the Long Island Intracoastal Waterway, length approximately 1.1 mi.. In addition, the project includes a deposition area at the entrance of the channel, 14 ft deep plus 2 ft overdepth, 350 ft wide, and 3,000 ft in length.

Refer to the Corp's Corps web site: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/8248/fact-sheet-moriches-inlet-new-york-maintenance-and-stewardship.aspx) for a detailed description of this project.

8. West of Shinnecock Inlet Interim Storm Damage Protection Project

The West of Shinnecock Inlet Storm Damage Protection Project was developed as an interim plan by the Corps to provide protection of the eastern end of Westhampton Island until the FIMP Study was completed. The project includes beach nourishment along the 4,000 ft long shoreline immediately west of Shinnecock Inlet, as a means to mitigate for the loss of beach resulting from the construction of the Federal Shinnecock Inlet Jetty Project. The project initially included periodic renourishment every 2 years for a period of 6 years. The Corps constructed the West of Shinnecock Inlet Interim project in 2005, placing approximately 610,000 cy of sand. The project consisted of dunes with a crest of 15 ft above National Geodectic Vertical Datum (NGVD) and a 90-ft-wide beach berm.

Refer to the Corps' website: (http://www.nan.usace.army.mil/Portals/37/docs/civilworks/SandyFiles/Army%20Corps%20West%20of%20Shinnecock%20Inlet_FCCE_FactSheet.pdf) for a detailed description of the project.

9. Great South Bay Federal Navigation Channel Maintenance Dredging Project

This project, authorized by the Rivers and Harbors Act of 13 June 1902 and modified in 1970, involves the Corps-implemented dredging of approximately 100,000 cy of beach-compatible sand from the Great South Bay Federal Navigation Channel. The placement site for the sand dredged material is located on the ocean-side beachfront of RMSP, specifically fronting the water tower between fields 3 and 4. This maintenance dredging project was last completed in 2014, when ere approximately 60,000 cy of sand dredged material was placed below the Spring High Water line (and the remaining 40,000 cy placed above the Spring High Water Line) across approximately 900,000 square ft of beach. Prior to the 2014 effort, this project was last completed in 1992 and will continue in the future as needed,

Refer to the Corps' website: (http://www.nan.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/11241/Article/487353/fact-sheet-great-south-bay-new-york-maintenance-of-infrastructure-stewardship.aspx) for a detailed description of the project.

## B. Federally-Authorized Local Actions

The Corps Regulatory Division: Issuance of permits under section 404 of the Clean Water Act (CWA) and section 10 of the Rivers and Harbor Act (RHA), including Suffolk County

Department of Public Works (SCDPW) Channel Maintenance Dredging and beach disposal projects (21 sites/projects in the Town of Islip and 33 in the Town of Brookhaven, as per Ethan C. Eldon Associates, Inc. 1995). Specific volumes of dredged and placed material were not available during the time of this report preparation but an estimated 6. 5 million cy of dredge material from back bay navigational channels/creeks were placed on Fire Island from 1949-1980 (Suffolk County Planning Department 1985).

Additionally, the Corps' regulatory district authorizes dredging projects within the FIMP project area. The following are recent examples of (but are not limited to) such projects:

1. 2011-2016: Captree Boat Basin Dredging

The Corps Regulatory Division authorized the on-going Captree Boat Basin Project which involves the dredging of navigable waters in the Captree Boat Basin located in western Great South Bay, with dredge material placement on the ocean shoreline of Fire Island in Robert Moses State Park (RMSP). Specifically, a Corps permit was issued to the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) in 2011 for 10-year maintenance dredging, via hydraulic dredge, of approximately 169,000 cy of material from the irregularly shaped East Captree Channel, with dredge material placement on ocean beaches in RMSP or placed in state-approved upland designated surplus material areas. The Corps issued a modification to expand the authorized dredging area and prism for an additional 320,000 cy of material for emergency shoreline repair work needed in response to Superstorm Sandy and completed section 7 of the ESA consultation (Service correspondence dated March 6, 2013). Dredging for this portion of the project (the east channel) was completed in April-May of 2013 with dredge material placement in Fields 4 and 5 of RMSP.

The NYSOPRHP requested a second modification for 10-year maintenance dredging of an additional 400,000 cy from the Captree State Channel west of the Robert Moses Bridge (NY District Corps Public Notice No. [PN] NAN-2010-00491-M2, published July 17, 2013). The irregularly-shaped West Captree Channel is approximately 400 ft by 3,550 ft in length and will be dredged, via hydraulic dredge, to a depth of approximately 14-ft below mean low water. The dredged materials will be pumped directly on approximately 12,000 linear ft of ocean beaches in RMSP (figure included in the PN depicts an area between Fields 2 and 3, eastward to 5), or the dredged material will be placed in state-approved upland designated surplus material areas (figure included in the PN depicts an area just west of Field 4 of RMSP). Approximately 108,000 cy of material would be deposited below the Spring High Water (SHW) line. This work was completed by the spring of 2014.

The total volume of sand authorized to be dredged from the Captree Boat Basin is, therefore, 889,000 cubic yards.

The stated purpose of the proposed action is to maintain safe navigable water depths for the vessels that use the waterway by removing sand shoaling resulting from Superstorm Sandy and provide beach nourishment for adjacent beaches damaged by Superstorm Sandy.

NYSOPRHP also applied for a Corps' permit in July of 2015 to dredge approximately 122,600 cy of beach compatible sand from another section of the Captree State Park Boat Channel, west of the above described dredging between Seganus Thatch and Oak Islands in Great South Bay north of Democrat Point. The proposed dredge area is approximately 5,100 ft in length, ranges in width from approximately 200 ft to 300 ft and extends to a maximum depth of 14 ft below the plane of Mean Low Water (MLW). The proposed placement sites for the sand dredged material are located in an existing stockpile area just north of the primary dune and at Fields 4 and 5 of RMSP for future beach nourishment (NY District Corps PN NAN-2015-00768-EBO, published July 16, 2015).

NYSOPRHP plans on conducting the dredge operation in the winter/early spring of 2015-2016.

2. 2015: Incorporated Village of Quogue Beach Nourishment Project

The applicant, the Incorporated Village of Quogue, requested authorization from the Department of the Army in July of 2015 for a one-time proposed borrow area dredging and sand beach placement event in the Atlantic Ocean, Village of Quogue, Town of Southampton, Suffolk County, New York.

Specifically, the proposed work, as described in the PN, would involve:

Dredging, via hydraulic cutterhead or hopper dredge, approximately 1,100,000 cy of beach compatible sand fill from an offshore sand borrow area located approximately 2 mi. offshore of the beach. Dredged material to be placed on the Atlantic Ocean shoreline along an approximately 14, 325 linear ft area in the Village of Quogue. Approximately 1,007,160 cy of dredged material would be placed waterward of the SHW Line over approximately 125 acres.

If used, a hydraulic cutterhead dredge would be connected by submerged pipe line to the shoreline. If used, a hopper dredge would collect sand in a hold and discharge the sand via submerged pipeline connected to the shoreline.

The proposed sand borrow area is located in the Atlantic Ocean, in waters approximately 40-60 ft deep. The applicant proposes to dredge approximately 7 ft below grade in the borrow area.

The applicant has stated that they have avoided, minimized, and mitigated for proposed impacts to the maximum extent practicable by matching the physical substrate with existing native material and proposing a no-work window from March 16 to September 30 of any calendar year.

The stated purpose of this project is to stabilize the shoreline, improve the beach-dune system and off-set chronic erosion.

This project is still being reviewed by the Corps, who is coordinating with the New York State Department of Environmental Conservation (NYSDEC) in their authorization process (NY District Corps PN NAN-2012-00011-EHA, published July 6, 2015).

3. 2015: Shinnecock Inlet Cut East Navigation Channel Dredging Project

The applicant, SCDPW, has requested authorization from the Department of the Army for the proposed dredging of approximately 107,000 cy of beach compatible sand from the Shinnecock Inlet Cut East Navigation Channel (in Shinnecock Bay adjacently northeast of the inlet). The dredge material will be placed on beaches located west of Shinnecock Inlet (on the Westhampton barrier island) and on the Shinnecock Nation Beach (within Shinnecock Indian Reservation). The applicant proposes to place 25,000 cy of sand dredged material will be placed as beach nourishment on the Shinnecock Nation Beach, of which approximately 10,000 cy are expected to fall below the plane of MHW line due to uncontrolled hydraulic slope. It is proposed that approximately 82,000 cy of dredged material be placed as beach nourishment on the beach west of Shinnecock Inlet, of which approximately 21,600 cy are expected to fall below the plane of MHW line due to uncontrolled hydraulic slope (NY District Corps PN NAN-2015-01093-EYR, published September 10, 2015).

4. 2013-2014: Bridgehampton-Water Mill Erosion Control District Beach Nourishment Project

The applicant, Bridgehampton-Water Mill Erosion Control District, Town of Southampton, requested Department of the Army authorization (NY District Corps PN NAN-2012-01095-EBO, published November 29, 2012) for the dredging of approximately 950,000 cy of sand from an offshore borrow area and placed along 15, 626 linear ft of eroded dunes and beach in the Hamlets of Bridgehampton and water Mill, Town of Southampton, Suffolk County, New York.

The work, as described in the PN, involved:

Dredging approximately 950,000 cy of clean compatible sand fill from an offshore sand borrow source and place the material on the shoreline and shape it into a design beach and dune fill along approximately 15,626 linear ft of Atlantic Ocean shoreline.

The sand was shaped with bulldozers into the final design template. Thereafter, the beach was shaped by natural wind, wave and tidal forces.

There are 4 offshore sites totaling 380 ac. proposed. The sites are collectively located in the same area identified by the Corps as Borrow Area in the FIMP and also identified in the Sagaponack Erosion Control District Beach Nourishment Project described below. The sand volume needed for this project was achieved by dredging 7-ft deep in an approximate area of 100 ac. defined within the 380-ac. borrow site.

Construction occurred from October 1 of 2013 to March 15 of 2014.

5. 2013-2014: Sagaponack Erosion Control District Beach Nourishment Project

The applicant, Sagaponack Erosion Control District, Town of Southampton, requested Department of the Army authorization (NY District Corps PN NAN-2012-01092, published on November 20, 2012) for the dredging of approximately 1,035,000 cy of sand from an offshore borrow area and placed along 14,125 linear ft of eroded dunes and beach in the Hamlet of Sagaponack, Town of Southampton, Suffolk County, New York.

The proposed work, as described in the PN, involved:

Dredging approximately 1,035,000 cy of clean compatible sand fill from an offshore sand borrow source and place the material on the shoreline and shape it into a design beach and dune fill along approximately 14,125 linear ft of Atlantic Ocean shoreline.

The sand was shaped with bulldozers into the final design template. Thereafter, the beach was shaped by natural wind, wave, and tidal forces.

There are 4 offshore sites totaling 380 ac. proposed. The sites are collectively located in the same area identified by the Corps as Borrow Area in the FIMP. The sand volume needed for this project will be achieved by dredging 7-ft deep in an approximate area of 100 ac. defined within the 380-ac. borrow site.

Construction occurred from October 1 of 2013 to March 15 of 2014.

6. 2013: New York State Department of Transportation (NYSDOT) Emergency Repair of Ocean Parkway

Under authority of the Corps Regional General Permit Number 15, Authorizing Remedial Activities Undertaken in Response to Major Storms: The NYSDOT hydraulically dredged approximately 790,000 cy of sand from Fire Island Inlet Federal Navigation Channel for the expedited repair/replacement to pre-storm conditions of Ocean Parkway, RMSP Traffic Circle, and adjacent Atlantic Ocean shorelines damaged by Hurricane Sandy, including dune systems and the Atlantic Ocean beaches seaward of dunes. Approximately 566,000 cy of dredged material were placed along Ocean Parkway and 224,000 cy in the vicinity of the Robert Moses Causeway Traffic Circle and Field 5 of RMSP in the Spring of 2013.

7. 2008: Fire Island Short-term Protection Project

This project addressed short-term storm surge protection for 5 mi. of ocean beach fronting the Fire Island National Seashore (FIIS) Communities by using beach scraping and beach nourishment for the period between 2008 and 2013. Over 1.8 million cy of dredged material was obtained from offshore borrow areas to construct the project. The intention was to: (1) provide protection for residential, commercial, and municipal structures, as well as public infrastructure within the communities from storm waves, tidal and wave surges, and flooding; (2) provide or improve beach width adequate for safe vehicular passage during all tidal cycles; and (3) enhance recreational use of the beaches (National Park Service 2008).

## C. Completed and On-Going Studies/Reports

Refer to the following NY District Corps website for a complete list of studies/reports that the Corps has completed for the FIMP study:

http://www.nan.usace.army.mil/Missions/CivilWorks/ProjectsinNewYork/FireIslandtoMontaukPointReformulationStudy/FIMPReports.aspx

Additional studies currently being conducted within the FIMP study area are listed as follows:

1. Virginia Tech Shorebird Project

Response of Piping Plovers and their Invertebrate Prey to Habitats Created By Hurricane Sandy (On-going, initiated in 2013): The goal of this project is to provide a broader ecological understanding of the ways in which breaches and Corps breach-fill projects affect piping plover populations and their invertebrate prey communities by comparing the dynamics of bird use and invertebrate densities in a breach area, two filled breach areas, overwash areas, and other areas. Ultimately the results will help refine the understanding of the time frame and manner in which piping plover habitat develops and persists.

In addition to monitoring breeding piping plovers, a key goal in the first year of the study was to band piping plover adults and chicks to allow comparison of the relative contribution of local recruitment versus immigration to population growth in storm-created habitat and artificially closed breaches in subsequent years of the study.

2. The Great South Bay Project

The Great South Bay Project sponsored by Stony Brook University and the NYSDOS, has been collecting water quality data in Great South Bay prior to and after Hurricane Sandy. The goal of this program is to gain a thorough understanding of the biogeochemistry of the Bay and its effect on pelagic and benthic communities. Currently this effort is supported by the NYSDOS in which observations and models are combined in support of the development of an ecosystem based management approach to address the ecological problems besetting the Bay.

3. Horseshoe Crab Monitoring

The NYSDEC and Cornell University Cooperative Extension are conducting on-going surveys of horseshoe crab spawning and migratory shorebirds in Jamaica Bay, south shore of Long Island sites (Moriches Bay), Peconic Estuary, and North Shore of Long Island sites to address the need in assessing and managing these resources in coastal New York State (http://www.nyhorseshoecrab.org/).

## III. DESCRIPTION OF THE STUDY AREA

### A. Study Area

The FIMP study area extends from Fire Island Inlet easterly to Montauk Point along the south shore of Long Island and Atlantic Coast of Suffolk County and is approximately 83 mi. long (U.S. Army Corps of Engineers 1997). The western and central portion of the study area are part of a barrier island system, composed of narrow, sandy beaches and peninsulas separated from the mainland by shallow bays (Tanski 2007). This barrier island system includes three estuarine bays: Great South Bay, Moriches Bay, and Shinnecock Bay, and three associated inlets, including Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet, respectively. The Corps' Inlet Modifications Report (U.S. Army Corps of Engineers 2007) provides a detailed history of these inlets. The bays are estuaries in that they are semi-enclosed by land with open access to the open ocean, and the ocean's waters are at least occasionally diluted by freshwater runoff from the land by way of numerous freshwater rivers and tributaries (Jones and Schubel 1980). Three barrier islands are present within the FIMP study area, referred to as Fire Island, the Westhampton barrier island, and the Southampton barrier island.

East of Southampton, in the eastern portion of the study area, the barrier island system gives way to the headland region, where the mainland directly abuts the ocean all the way to Montauk Point (approximately 30 mi. in length). In the western portion of this region, sandy beaches separate the ocean from a low-lying plain made of material deposited by waters melting from glaciers tens of thousands of years ago (Tanski 2007). To the east, the flat plains are replaced by 40-60 ft high bluffs formed when glaciers stopped their advance southward and dropped the material being transported, ranging from large boulders to fine clays (Tanski 2007). Three coastal ponds are also present within the headland region of the study area including Mecox Bay, Sagaponack Lake, and Georgica Pond.

Land use within the FIMP includes recreational beaches, residential communities, summer resort communities, open space/parkland/refuges, commercial fishing, and commercial/industrial development.

Federal, state, and county lands are depicted in Figures 2a, 2b, and 2c.

Hurricane Sandy

On October 29, 2012, Hurricane Sandy made landfall on Long Island and affected fish and wildlife resources on both a short- (within a year) and long-term (to present time) timescale and illustrated what the TSP is proposed to minimize/prevent. According to the National Hurricane Center, Hurricane Sandy, at nearly 2,000 kilometers (km) in diameter, was the largest storm on historical record in the Atlantic basin (Hapke *et al.* 2013). It affected extensive areas of the east coast of the United States (U.S), including and on Long Island. In some areas, dunes were extensively overwashed and several breaches formed as the storm made landfall during astronomical high tides (Hapke *et al.* 2013). While strong coastal storms such as Hurricane Sandy can often result in severe damages to physical structures, particularly on the barrier islands, they are an important natural process of barrier islands that allow these systems to evolve in response to sea-level rise (Hapke *et al.* 2013).

Both developed and undeveloped beaches on Fire Island experienced profound changes as a result of the storm (Hapke *et al.* 2013). The storm created three breaches and extensive overwash areas on the eastern end of Fire Island. The U.S. Geological Survey (USGS) undertook a rapid assessment of the areal extent and depth of overwash deposits shortly after the storm (Hapke *et al.* 2013). In the western portion of the island, 147 ac. of overwash areas were identified. However, these deposits were limited in many locations by residential development and other infrastructure. Much of the material was deposited on private property, concrete walkways, etc., and was mechanically redistributed back on the beach during post-storm clean up and dune construction activities. In the central areas of Fire Island, the occurrence of overwash was relatively low (31 ac.) and primarily confined to existing dune cuts that served as vehicle access points or other lows spots between the dunes. The greatest areal extent of overwash deposits, or 220 ac, occurred on eastern Fire Island, and were concentrated in the vicinity of Old Inlet in the federal wilderness area and east of the TWA Flight 800 Memorial at Smith Point County Park (Hapke *et al.* 2013).

Three breaches formed on Fire Island at Smith Point (40.750156N, -72.811806W), Old Inlet (40.723509N, -72.894704W), and eastern Fire Island Pines (40.667489N, -73.055264W). The breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide (Papa, U.S. Fish and Wildlife Service, personal observation), but was closed by the Corps under the provisions of the Corps' BCP in December 2012. The breach at Old Inlet remains open and options concerning its management are being explored by the NPS in accordance with the Fire Island Wilderness Act of 1983 (PL 95-585) and the NEPA. The breach at eastern Fire Island Pines did not require any action under the Corps' BCP as no exchange of bay and ocean water was observed after the storm passed and tidal levels subsided.

Refer to sections 3.0 of the Corps' EIS for a description of the Affected Environment; 3.7 for Land Use Development, Policy, and Zoning; and 3.8 for Recreational Activities within the FIMP study area.

## B. Audubon Important Bird Areas (IBA)

The Audubon Society has designated 10 areas within the FIMP as IBA's (see Figure 4). The IBA program is a bird conservation initiative whose goal is to identify the most important places for birds and conserve them (Burger and Liner 2005). The IBA's and descriptions (excerpted from Audubon website: http://iba.audubon.org/iba/stateIndex.do?state=US-NY) are listed as follows:

<u>Captree Island Vicinity</u>

*Site Description*: This site includes the barrier islands on the south shore of Long Island, and the islands and marshes on the bayside. Sandy beach and dune systems, natural saltmarshes, and spoil islands are included. According to the NY-GAP land cover data, approximately 20 percent of the site is saltmarsh habitat. The site extends from the Nassau/Suffolk county line east to and including Captree Island and Robert Moses State Park. It includes the eastern end of Jones Beach Island and the western tip of Fire Island. The interior of the barrier island is bisected by a four-lane highway with associated heavily developed recreational areas and large parking areas. Ownership is a mix of public (Captree Island State Park, Gilgo State Park, and RMSP, administered by NYSOPRHP), municipal, and private.

*Ornithological Summary*: This site supports high numbers of wading birds during the breeding season: 125 pairs in 1993, 140 in 1992, 54 in 1991, 206 in 1990, 365 in 1989, 194 in 1988, 305 in 1987, 375 in 1986, 171 in 1985, and 120 in 1984. Wading birds include great egrets

(*Casmerodius albus*; 6 pairs in 1995, representing 1 percent of the State's coastal population), snowy egrets (*Egretta thula*; 10 pairs in 1995; 2 percent of the State population), little blue herons (*E. caerulea*; 5 pairs in 1995; 19 percent of State population), tricolored herons (*E. tricolor*; 10 pairs in 1995; 38 percent of the State population), black-crowned night-herons (*Nycticorax nycticorax*; 75 pairs in 1995; 4 percent of the State coastal population), and glossy ibis (*Plegadis falcinellus*; 80 pairs in 1995; 11 percent of the State population). In recent years, the total number of wading birds has dropped to under 100 individuals. The site supports at-risk species, including northern harriers (*Circus cyaneus*; breeds and migrant), black rails (*Laterallus jamaicensis*; one pair in 1997, the only known breeding location in the State), piping plovers (8 pairs in 1994; 4 percent of the State breeding population), American oystercatchers (*Haematopus palliatus*; 31 pairs in 1995; 17 percent of the State population), herring gulls (*Larus argentatus*; 893 pairs in 1995; 8 percent of the State population), great black-backed gulls (L. marinus) (68 pairs in 1995; 1 percent of the State population), roseate terns (75 pairs in 1994; 5 percent of the State population), common terns (*S. hirundo*; 2,000 pairs in 1994; 12 percent of the State coastal population), least terns (*S. antillarum*; 200 pairs in 1994; 8 percent of the State population), black skimmers (*Rynchops niger*; 33 pairs in 1994; 6 percent of the State population), short-eared owls (*Asio flammeus*; breeds), horned lark (*Eremophila alpestris*; breeds and migrant), saltmarsh sharp-tailed sparrow (*Ammodramus caudacutus*), and seaside sparrow (A. maritimus). Other saltmarsh breeders include clapper rails (*Rallus longirostris*) and willets (*Catoptrophorus semipalmatus*). The area is also important for passerine migrants and raptors, particularly in the fall. The tidal area at Democrat Point at the western tip of Fire Island hosts a great diversity and abundance of shorebirds. This is one of the few sites in the State with regularly breeding Chuck-will's-widow (*Caprimulgus carolinensis*).

Great South Bay

*Site Description*: This site is a protected, open water bay behind Fire Island and Jones Beach Islands, extending roughly from the Nassau/Suffolk County line in the west to Bellport Bay in the east, including eastern Jones Beach (Gilgo and Cedar Beaches). It is the largest shallow saltwater bay in the State, with sandy shoals and extensive eelgrass beds. Great South Bay is a highly productive ecosystem and supports a regionally important commercial and recreational fishery. Sea turtles, including the Kemp's ridley turtle (*Lepidochelys kempi*), loggerhead turtle (*Caretta caretta*), and green sea turtle (*Chelonia mydas*), regularly forage in the area.

*Ornithological Summary*: This is an important waterfowl wintering area. It supports an estimated 25 percent of the State's wintering American black ducks (*Anas rubripes*) and 22 percent of the State's wintering scaup, according to an analysis done by the NYSDEC using aerial waterfowl surveys from 1973-1994. The Captree Christmas Bird Count (CBC), which covers a portion of the site, has documented averages from 1980-1989 of 1,842 (maximum 3,379) brants (*Branta bernicla*); 1,501 (maximum 2,383) American black ducks; and 8,262 (maximum 18,028) greater scaup (*Aythya marila*). Mixed Species - 5,681 individuals in 2004; 8,296 in 2003; 8,707 in 2002; 1,652 in 2001; 9,019 in 2000; 3,685 in 1999, Winter. Congregations: Shorebirds/Mixed Species - 196 individuals on May 18, 1995; 528 on August 18, 1994; 408 on July 24, 1993; 617 on August 10, 1992; 1,416 on August 11, 1991, Migration.

Connetquot Estuary

*Site Description*: This site is located within the Connetquot River watershed and includes Connetquot River State Park, Benton Bay, Heckscher State Park, and surrounding lands. Uplands include relatively large areas of pine barrens, oak-pine woodlands, and oak brush plains. Saltmarsh/tidal creek wetlands are found near the mouth of river. According to the NY-GAP land cover data, approximately 50 percent of this site is shrub habitat, which includes old/field pasture and pitch pine oak. The Connetquot is one of only four major rivers on Long Island, supporting one of the few wild brook trout (*Salvelinus fontinalis*) populations on Long Island. A number of rare plants occur in the area, as well.

*Ornithological Summary*: This is one of the largest areas of undeveloped pitch pine/scrub oak and general scrub habitat on eastern Long Island. It harbors significant populations of characteristic shrub/scrub species, including the northern bobwhite (*Colinus virginianus*), American woodcock (*Scolopax minor*), whip-poor-will (Caprimulgus vociferus), eastern kingbird (*Tyrannus tyrannus*), gray catbird (*Dumetella carolinensis*), brown thrasher (*Toxostoma rufum*), blue-winged warbler (*Vermivora pinus*), prairie warbler (*Dendroica discolor*), eastern towhee (*Pipilo erythrophthalmus*), and field sparrow (*Spizella pusilla*). Small numbers of breeding common terns (35 pairs in 1997) and least terns (9 pairs in 1997) are present at Timber Point. Tidal wetland habitats also support breeding willets, marsh wrens (*Cistothorus palustris*), and saltmarsh sharp-tailed sparrows, and provide important foraging habitat for snowy egrets and least terns.

Fire Island

*Site Description*: This site includes all but the westernmost few miles of Fire Island, a 32-mi. long, quarter-mile wide barrier beach island off the southern shore of Long Island. According to the NY-GAP land cover data, over 15 percent of this site is beach/dune habitat. A site almost 8 mi. long – the Otis G. Pike Wilderness Area - is the only federal wilderness area in the State. A number of small communities are scattered along the island. The Fire Island Lighthouse, located 5 mi. from the western tip, is located near a bird banding station and hawk watch site.

*Ornithological Summary*: This site supports colonial nesting species, including piping plovers, common terns, and least terns. The site serves as a raptor migration corridor, with an average of 5,000 hawks and a maximum of 6,654 between 1980 and 1995. Especially high numbers of American kestrels (*Falco sparverius*; average 2,400; maximum 3,523), merlins (*F. columbarius*; average 1,230; maximum 1,638), and peregrine falcons (*Falco peregrinus*; average 146; maximum 249) have been documented. The area is a stopover for diverse passerine migrants, with thousands of birds visiting in the fall. A full-scale banding operation that had been discontinued for several years has been resumed.

Carmans River Estuary

*Site Description*: Situated on the south shore of Long Island, this site includes the Carmans River, a New York State-designated Wild and Scenic River, and its estuary, as well as uplands composed of oak and pine barren vegetation (part of the Long Island Pine Barrens). The core protected portion of the area is the 2,550-ac Wertheim National Wildlife Refuge (NWR). According to the NY-GAP land cover data, this site includes approximately 675 ac. of saltmarsh habitat. The estuary provides an important spawning and nursery area for an abundance of fish and other aquatic life and is one of only four known breeding sites in the state for the eastern mud turtle (*Kinosternon subrubrum*). The site is primarily owned by the Service and Suffolk County Parks, and the rest is privately owned.

*Ornithological Summary*: This site is important for breeding and wintering waterfowl (3,000-4,000 on average), including large numbers of American black ducks (60 percent of all waterfowl at the site) and greater scaup at the mouth of the river. Hooded and common mergansers (*Lophodytes cucullatus* and *Mergus merganser*, respectively) winter further upriver, where the site provides open water in the winter when the bay freezes. The area also supports the largest breeding population of wood ducks (*Aix sponsa*) on Long Island. Carmans River's marshes support breeding at-risk birds, including the American black duck, American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*; winters), saltmarsh sharp-tailed sparrow (probably exceeds IBA threshold, but further data is needed), and seaside sparrow. Clapper rails and willets are also found here. During fall migration, the marshes support 5-10 shorebirds per acre, including the semipalmated plover (*Charadrius semipalmatus*), greater and lesser yellowlegs (*Tringa melanoleuca* and *T. flavipes*, respectively), semipalmated sandpiper (*Calidris pusilla*), least sandpiper (*C. minutilla*), and pectoral sandpiper (*C. melanotos*). Also, wading birds can be seen along the river and refuge marshes, including the great blue heron (*Ardea herodias*), great egret, snowy egret, little blue heron, and glossy ibis. Migrating tree swallows (Tachycineta bicolor) come to the marshes along the Carmans River in the last weeks of September to roost. The swallows primarily congregate in the marshes that are part of the Wertheim NWR. The estimated flock size is many thousands, numbering in the tens of thousands on some nights. These marshes also provide important habitat for thousands of red-winged blackbirds (*Agelaius phoeniceus*). The banks are bordered mostly with common reed (*Phragmites australis*), with some common cattail (*Typha latifolia*) and other brackish tolerant species.

<u>Moriches Bay</u>

*Site Description*: This site consists of a bay, marsh, and barrier beach complex (with adjoining uplands) on the south shore of Long Island, extending from the Floyd Estate in Mastic (mainland portion of the FIIS) in the west to Westhampton Beach in the east. The site includes Haven's Estate and Cupsogue County Park, both owned by Suffolk County. It is a productive area for marine finfish, shellfish, and other wildlife.

*Ornithological Summary*: This site is important for nesting wading birds. West Inlet Island alone supports large numbers of great egrets (108 pairs in 2004), snowy egrets (59 pairs in 2004), little blue heron (2 pairs in 2004), tricolored heron (1 pair in 2004), black-crowned night-heron (155 pairs in 2004), and glossy ibis (44 pairs in 2004). The site also supports at risk species such as osprey (breeds), piping plovers (48 pairs in 1998), roseate terns (four pairs in 1998), common terns (631 pairs in 1999), least terns (6 pairs in 1999), black skimmers (23 pairs in 1998), and seaside sparrow (breeds). Herring gulls (368 pairs in 1995; 3 percent of the State population.) and great black-backed gulls (168 pairs in 1995; 3 percent of the State population) nest here, as well. The saltmarshes support breeding clapper rails, American oystercatchers, willets, and saltmarsh sharp-tailed sparrows. The site is also an important waterfowl wintering area. NYSDEC mid-winter aerial waterfowl surveys from 1975-1984 documented over 5,000 individuals on average (8,382 in peak year). These included an average of 350 brant (580 maximum), 400 Canada geese (*Branta canadensis*; 870 maximum), 1,100 American black ducks (1,580 maximum), 225 mallards (*Anas platyrhynchos*; 430 maximum), 2,150 scaup (4,470 maximum), and 400 red-breasted mergansers (*Mergus serrator*; 920 maximum). Congregations: Waterfowl/Mixed Species - Over 5,000 individual waterfowl on average, with 8,382 individuals during the peak year. Congregations: Waterbirds/Terns - Estimated 637 pairs in 1999; 1,129 in 1998; 920 in 1997; 1,504 in 1996; 586 in 1995; 216 in 1994; and 948 in 1993. Congregations: Wading Birds/Mixed Species - Islands in the bay easily support more than 100 pairs of nesting herons.

Shinnecock Bay

*Site Description*: This site includes a diverse region of barrier island beaches, saltmarshes, dredge spoil islands, and surrounding bays and estuaries. It includes 5 mi. of mostly undeveloped shoreline along the southernmost part of Shinnecock Bay, and large undeveloped tidal wetlands that are relatively rare in the State.

*Ornithological Summary*: This was not provided by Audubon Society. See the Bay Intertidal Section (page 58) for the Service's Ornithological Summary.

Mecox Sagaponack Coastal Dunes

*Site Description*: This site includes the coastal beaches and wetlands extending from Watermill Beach in the west to Georgica Pond in the east. The site includes undeveloped flats, sand bars, and an ocean inlet.

*Ornithological Summary*: The area is important to breeding piping plovers and least terns, migrating shorebirds, and wintering waterfowl.

Napeague Harbor and Beach

*Site Description*: This site includes the Napeague State Park, administered by NYSOPRHP, and surrounding wetlands and beaches, including Napeague Harbor.

*Ornithological Summary*: This site provides important habitat for the northern harrier (male and female have been observed), piping plover (six pairs in 1999), common tern (two pairs in 1997), and least tern (five pairs in 1999).

Montauk Point

*Site Description*: This site includes the easternmost point of land on Long Island, extending from Lake Montauk in the west to Montauk Point State Park and including the offshore waters. A large portion of the area is under public ownership, including Montauk Point State Park and

Camp Hero State Park. The site contains an impressive diversity of maritime upland, wetland, and shoreline habitats. According to the NY-GAP land cover data, over 35 percent of this site is shrub habitat, which includes pitch pine oak, shrub swamp, and successional hardwoods. The waters off of the point contain extensive blue mussel (*Mytilus edulis*) and kelp (*Laminaria agardhii*) beds and are an important feeding area for juvenile Kemp's ridley turtles, loggerhead turtles, and leatherback turtles (*Dermochelys coriacea*). Marine mammals including gray seals (*Halichoerus grypus*), harbor seals (*Phoca vitulina*), northern right whales (*Eubalaena glacialis*), finback whales (*Balaenoptera physalus*), humpback whales (*Megaptera novaeangliae*), and minke whales (*Balaenoptera acutorostrata*) regularly forage in or migrate through the near-shore waters.

*Ornithological Summary*: The point is a very important waterfowl wintering area, with the largest winter concentration of sea ducks in the State. A waterfowl count in January 1997 documented 17,514 common eiders (*Somateria spectabilis*), 120 long-tailed ducks (*Clangula hyemalis*), 1,900 surf scoters (*Melanitta perspicillata*), 2,402 white-winged scoters (*M. fusca*), 1,000 black scoters (*M. nigra*), and 320 red-breasted mergansers. The 1996 NYSDEC mid-winter aerial waterfowl survey documented 4,300 scoters and 250 long-tailed ducks. The December 1995 CBC tallied 1,500 greater scaup, over 5,000 common eiders, over 500 white-winged scoters, over 600 common golden-eyes (*Bucephala clangula*), and over 600 red-breasted mergansers. King eiders (*Somateria spectabilis*) and harlequin ducks (*Histrionicus histrionicus*) occur here regularly in winter. Montauk is the southernmost wintering area for common eiders and harlequin ducks on the East Coast. Sizable concentrations of pelagic seabirds occur in the waters off the point. For example, 250 northern gannets (*Morus bassanus*) were counted in the December 1995 CBC. Wetland areas around Big and Little Reed Ponds support confirmed or probable breeding at-risk species, including the American black duck, least bittern, northern harrier, and red-shouldered hawk (*Buteo lineatus*). Upland areas host characteristic shrub breeding species including the northern bobwhite, American woodcock, eastern kingbird, gray catbird, brown thrasher, blue-winged warbler, prairie warbler, eastern towhee, and field sparrow.

<u>New York State Bird Conservation Areas (BCA)</u>

The New York State BCA Program was established in 1997 to safeguard and enhance bird populations and their habitats on State lands and waters. The goal of the BCA Program is to integrate bird conservation interests into agency planning, management and research projects, within the context of agency missions. The BCA Program is modeled after the National Audubon Society's IBA program, which began in New York in 1996. The BCA Program applies criteria developed under the IBA program to State-owned properties (New York State Department of Environmental Conservation website http://www.dec.ny.gov/animals/30935.html).

The only New York State BCA located within the FIMP is the South Shore Tidal Wetlands area, which includes 20 State-owned properties, further described above in the State lands section. The following description is excerpted from the NYSDEC's website (http://www.dec.ny.gov/animals/27026.html):

This BCA is comprised of tidal saltmarshes with areas of associated upland habitat as well as open water in the form of creeks, channels, and ditches, located on the bays of the south shore of Long Island. The habitat ranges from open water and tidal mud flats to Spartina (*Spartina alterniflora*) marsh and dense upland forest. The marshes support a diverse mix of uncommon bird species such as seaside sparrow, saltmarsh sharp-tailed sparrow, clapper rail, and northern harrier, while the uplands provide critical migration habitat for birds crossing the ocean and bays. The wetland habitats are threatened by erosion, invasive plant species, and loss of tidal flow. Birds of interest include northern harrier (Threatened), common tern (Threatened), osprey (Special Concern), seaside sparrow (Special Concern), clapper rail, and, possibly, short-eared owl (Endangered).

## C. Habitat and Ecosystem Designations

The study area consists of numerous communities, ecosystems, and habitats that have been designated and identified in several publications and efforts. These efforts/publications include the FIMP Habitat Evaluation Team, the Service's Restoration PAL, the Corps' Conceptual model publications, and the Corps' cover type designations. The following is a listing of the effort or publication and the corresponding cover type/community/habitat designations:

For the purposes of this report and for consistency with the Corps' efforts, the Service shall use the habitat designations developed by the Corps in their conceptual model Phase III publication (U.S. Army Corps of Engineers 2006a). (The Service also designates two additional habitats – Bay Islands within the Bay Ecosystem and Mainland Uplands/Wetlands within the Terrestrial Upland portion of the Barrier Island Ecosystem.) The publication identifies four ecosystems within the project area as follows (Figure 3):

- Coastal Marine Ecosystem;
- Ocean Beach and Dune Ecosystem;
- Bay Ecosystem; and
- Barrier Island Ecosystem.

<u>Coastal Marine Ecosystem</u>

This ecosystem consists of the following habitats:

*Offshore* – Subtidal marine habitat ranging in depth from 10 to 30 meters (m.); includes pelagic and benthic zones.

*Nearshore* – MLW to depth of 10 m.; includes pelagic and benthic components.

*Marine Intertidal* – Extends from the boundary of the marine nearshore at MLW, to mean high water (MHW); sandy substrate.

Ocean Beach and Dune Ecosystem

This ecosystem consists of the following habitats:

*Marine Beach* – Extends from the MHW line on the oceanside to the boundary of the primary dune and swale habitat with the terrestrial upland; sandy substrate.

*Dunes and Swales* – Primary dune through most landward primary swale system.

Bay Ecosystem

This ecosystem consists of the following habitats:

*Bay Intertidal* – Extends from the terrestrial upland boundary with MHW, or landward limit of high marsh vegetation of the barrier island terrestrial upland habitat, to MLW; includes other habitats such as tidal marsh, shoals, and/or mud flat.

*Bay Subtidal* – Bayside aquatic areas below the MLW, includes submerged aquatic vegetation (SAV) beds (bayside vegetation communities found within the subtidal zone).

*Inlets* – Areas of water interchange between backbay and ocean zones (*e.g.*, Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet).

*Bay Islands* – An important habitat present within the FIMP study area that the Corps does not account for in their habitat designations is bay islands, which, for the purposes of this document, are defined as upland islands in one of the bays, landward of the bay intertidal areas but not connected to the mainland of Long Island.

Barrier Island Ecosystem

This ecosystem consists of the following habitat:

*Terrestrial Upland* – Extends from the landward boundary of the primary dunes and swales on the oceanside, to the MHW boundary of the bay intertidal habitat on the bay side of the island; contains all upland and wetland habitats, including the maritime forest; scrub/shrub are also included in this habitat, along with bayside beach areas.

## D. Physical Processes and Habitat Formation

The Service recognizes that the project area contains land development, and hence the proposal for the project. However, the review of the project includes an analysis of the barrier island system as a whole; therefore, discussions include descriptions of the processes which occur over the entire system.

A constantly evolving and changing habitat complex, unusual in other landforms, is typical of barrier islands. Changes in the islands' shape and position occur from season to season, and even day-to-day. The sandy ocean beachfront constantly adjusts to the balance between two factors: (1) the erosive forces of storm winds and waves, and (2) the restorative powers of prevailing geological, oceanic, and meteorological actions. In response to the interplay of these forces, the whole system of beaches, barrier islands, and dunes shift more or less continuously (Tanski 2007). Over a longer time span, the mass/energy interaction has resulted in a relatively continuous, though intermittent, landward migration (Panageotou *et al.* 1985, Hapke *et al.* 2013) of Long Island's barrier island system.

Sea Level Rise

The force driving the islands landward is rising sea level. The relative sea level rise in the New York area has averaged about 2 millimeters (mm) (0.1 inch [in.]) per year during the past 50+ years (Leatherman and Allen 1985a, Tanski 2007). Since 1993, sea level rise has increased to 3.2 mm/year (Church and White 2011). By 2100, scientists project sea levels 18 to 50 in. higher than today along New York's coastlines and estuaries, though a rise as high as 75 inches could occur (New York State Department of Environmental Conservation 2015a).

The GRR states that coastal flooding is likely to increase in magnitude due to future elevated rates of sea-level rise. However, throughout most of the document, analyses of damages and benefits are based on the assumption of an historical sea level rise rate. Although the Future Without Project and TSP plans are evaluated using the more realistic "intermediate" and "high" rates of sea level rise in the short discussion of Table 51, the reader should be reminded up front that there is debate regarding the sea-level rise rates used in the majority of the document that require further coordination between the Corps and the DOI. The combined Table discussed above could easily be reproduced for the different sea level rise rates and also presented in the main body of the GRR with a clear description of why these model's costs (and benefits) increase, including the assumptions made.

The documents do not clearly state how this project, designed with historic sea-level rise numbers, perform into the future. How this project is modified or not in the future needs to be explained now so we can understand the potential benefits or impacts (to DOI resources) of the project with increased sea level.

In addition, the DEIS/GRR should present how the damages change with sea-level rise and how this affects the cost/benefit ratio, how it would be addressed in an adaptive management plan, local land use planning, the effects on habitat or how the project may change and affect habitat/species in the future. This is poorly described in Table 51 of the GRR. It appears that the assumption is made that although breach closure costs increase (TSP), the benefit of "total breach closure' go up even higher. Has the assumption been made that the TSP will close all breaches in the Wilderness area? The table also indicates that the backbay inundation benefits go up somewhat, which suggests that the non-structural component has a larger influence at higher rates of SLR. This information and assumptions should be clarified in the revised GRR.

Barrier Island Migration

The phenomenon of migration is often termed erosion by some, but this is not accurately descriptive for barrier beaches. What happens to the whole barrier landform is not erosion in the sense that the barrier is being chopped away and is gradually disappearing; barriers retreat or migrate and they do so as entire ecological units. In marked contrast to the sea cliffs which erode from fixed positions, coastal barriers move themselves backwards onto marsh and lagoonal deposits as they climb the slope of the continental shelf (Department of the Interior 1983; Hapke *et al.* 2013).

As the barrier landform retreats, its transported sand buries parts of its system, such as saltmarshes, while new marshes develop further landward on the leading edge of the new sediment. Although a barrier's movement is at least partly in response to the steadily rising sea level (Tanski 2007), as well as the amount of off-shore sediment present seaward of the shore, the pace of its migration is not steady. Its migration depends in large part upon crucial events which occur during storms: inlet formation and overwash. These are the primary mechanisms by which sand is transported landward from the oceanfront, along with a third process which occurs on some coastal barriers: wind-blown dune migration (Department of the Interior 1983; U.S. Army Corps of Engineers 2016a).

All three of the processes described below can be affected by stabilized dune systems. Formation and stabilization of well-developed dunes can significantly moderate a barrier's dynamic of change. Inlets contribute to barrier island retreat. Enormous quantities of sand can be swept through a new inlet. Marshes form on the new flood tidal delta. The net result of these dynamics forces is the further retreat of the barrier system with all ecological units retained (Department of the Interior 1983; Tanski 2007; Hapke 2013).

1. Overwash

Barrier beaches in active retreat actually roll over themselves into the lagoon or back-bay. The most common mechanism for accomplishing this is overwash, the breaching of dunes by a severe storm surge which carries beach and dune sand onto the backdune region (Figures 18 and 19). Depending on the storm's magnitude and the island's width, the overwash area of newly transported sand may go no further than the dunes, or it may spread onto the marshes or into the lagoon. In general, major overwashes only occur during exceptionally severe storms (Department of the Interior 1983; Tanski 2007).

Overwash processes can provide a source of sediments to the barrier island and contribute to elevational changes. In locations where the dunes are not breached during a major storm, washover deposits are negligible, and the dominant sediment transport direction is seaward. In locations where the dune is absent or breached, overwash processes are uni-directional, delivering sand to the island surface, but not removing sand from the littoral system as an inlet would (Leatherman 1985). These rare but potentially large overwashes generally result in localized accretion on the bay side (New York Sea Grant Institute 1993; Walter & Kirwan 2016). Hurricane/Superstorm Sandy caused extensive overwash on Fire Island, although inland deposits accounted for only 14 percent of the volume lost from beaches and dunes, indicating that the majority of this material was moved offshore (Hapke *et al.* 2013).

2. Inlet Dynamics

Barrier ecosystems seem to rely mainly upon inlet dynamics for landward displacement. Migrating and temporary inlets/breaches provide flood tidal deltas upon which the barrier island environments are established. A flood tidal delta exhibits a deltaic pattern upon full development, and when an inlet closes or migrates it becomes prime substrate for saltmarsh development. These actually become the substrates for marsh growth and thereby extend the bay shoreline landward. Wind-carried and overwash sediments then are deposited on top of this accretionary base. These two types of sediment movement (via wind and overwash) are also what makes it possible for a barrier to grow vertically (Department of the Interior 1983; Walters and Kirwan 2016). While inlet formation is an infrequent process in this barrier island system, it is within the range of natural variability of that system.

Significant storm conditions are required in order to induce the formation of an inlet. This fact is emphasized by the number of washovers that occur during large storms. Few of these washovers cross the island completely, much less produce new inlets. Of the 4 inlets that opened into Shinnecock Bay in 1938, only Shinnecock Inlet persisted, eventually being stabilized by the Corps in 1954. The hurricane of 1938 washed over the entire beach between Democrat Point and Ocean Beach and many other places as well (Bokuniewicz and Schubel 1991; Tanski 2007). After that, 63 washovers occurred after a hurricane in 1944. Thirteen washovers were found after a storm in 1949. A storm in 1953 caused seven or more washovers, while nine washovers were reported after a storm in 1960. Fifty more occurred after another storm in 1962. A storm in 1963 produced 4 washovers on eastern Fire Island. None of these washovers resulted in a permanent inlet. For inlet formation to occur, certain geophysical and meteorological conditions must be met. Leatherman (1982) states that overwash is a relatively common event, happening during most major storms, but that inlets are relatively rare, occurring only once in 50 to 75 years along some shorelines. This implies that the opportunity for inlet-based habitat formation is an equally rare occurrence.

Inlets of varying size and number have developed at various times in Fire Island's history, particularly in eastern Fire Island. By examining the barrier island chain from Fire Island to Montauk Point, it can be demonstrated that 59 percent of the system has been subject to inlet activity (Leatherman and Allen 1985b). Other parts of Fire Island, particularly the central portion, have been stable for hundreds of years. For example, Fire Island's Sunken Forest, a true maritime forest, could only have developed under conditions of prolonged limitation of environmental stresses, particularly salt spray and saltwater flooding (Leatherman *et al.* 1985). The development of the Sunken Forest is due to the fact that it is protected behind a high secondary dune. In this location, washovers do not penetrate the secondary dune, which is also effective at screening back-barrier vegetation from salt spray. The western part of Fire Island has not migrated landward but has narrowed while following the migration of Fire Island Inlet to the west.

As stated above, three breaches formed on Fire Island at Smith, Old Inlet, and eastern Fire Island Pines. The breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide (Papa, personal observation), but was closed by the Corps under the provisions of the Corps' BCP in December 2012. The breach at Old Inlet remains open and options concerning its management are being explored by the NPS in accordance with the Fire Island Wilderness Act of 1983 (PL 95-585) and the NEPA. The breach at eastern Fire Island Pines did not require any action under the Corps' BCP as no exchange of bay and ocean water was observed after the storm passed and tidal levels subsided.

3. Habitat Formation

Along the south shore of Long Island, the normal evolution for an inlet results in sediments and geomorphic features moving both northward (landward) and westward (downdrift) (Leatherman 1985; Tanski 2007). This inlet migration in two directions over time gives rise to complex sedimentary patterns involving a variety of different inlet-related environments: bay bottom, deep to shallow inlet channel, active and relict flood and ebb tidal deltas (Figure 20), spit platform, and spit (Figure 21) (Leatherman 1985; Rice 2009). Each of these sedimentary forms has specific niche functions in the ecology of Great South (New York Sea Grant Institute 1993) Moriches and Shinnecock Bays. The outstanding biological diversity and abundance of Long Island's south shore estuary is, in part, a consequence of the variety of habitat types within the system.

Through time, an unstabilized inlet achieves a net downdrift migration and in most caseseventually becomes choked with sand and closes. Marsh islands develop in the bay if the flood tidal delta achieves sufficient elevation and the bay hydrodynamic environment supports its development. Eelgrass beds may develop below the MLW line of the flood tidal delta at a depth controlled by turbidity and bay wave turbulence. The presence of saltmarsh islands and the wide bayside marshy plains on the northern shore of Long Island's barrier islands can be an impediment to inlet development because of the resistance of the marshy substrate to erosion. Inlet migration and closure depend upon the longshore current and the tidal jet flushing capacity (Leatherman 1985). The subsequent formation of flood tidal deltas varies in time depending on the forces at the inlet.

Comparison of wetland areas and historical inlet locations illustrate that barrier islands have widened and strengthened at historical inlet sites. Creation of these wetland areas has also led to habitat formation. Inlet processes are mainly responsible for providing sediment to the barrier bayshore, causing a widening of the island at inlet locations and, therefore, promoting landward migration (Leatherman *et al.* 1985). When the inlet closes, this large sedimentary deposit becomes an excellent substrate for potential saltmarsh colonization (Gregg 1982; Leatherman 1982; National Park Service 1995). The marsh islands in the bay and most, if not all, of the bayshore marshes formed atop flood-tidal delta sediments (Leatherman *et al.* 1985; New York Sea Grant Institute 1993) in locations where bay wave energies are sufficiently small.

Overwash contributes in several important ways to maintaining barrier islands and their ecosystem functions, especially as habitat for many plant and animal species. In the process of the barrier island's growth through overwash, several important unique landforms are produced, including overwash channels, overwash fans, vegetated and non-vegetated subtidal flats, and backdunal swales. Overwash that crosses the entire barrier island leaves behind distinct corridors known as washovers (Kana and Krishnamohan 1994). These areas are important biological corridors, linking ocean and bay habitat. Several species, especially the piping plover, are known to take advantage of the increased access to bayside forage areas afforded by overwash corridors (Cohen *et al.* 2009).

Overwash maintains unvegetated intertidal sand flats by providing a vital clearing function, similar to naturally occurring forest fires and river bank floods. Bayside sand spits are especially productive for shorebirds and wading birds. A new spit and shoal complex formed following the 1992 breach at Westhampton and has become a highly productive nesting and forage area for shorebirds, including black skimmer (*Rhynchops niger*), American oystercatcher (*Haematopus palliatus*), willet (*Catoptrophorous semipalmatus*), least tern, common tern, and piping plover. This area produced one of the highest nesting densities of piping plover in the state of New York from 1995 to 1996 (New York State Department of Environmental Conservation 2002).

Both overwash fans and flood tidal deltas are prime spawning grounds for the horseshoe crab (*Limulus polyphemus*) (New York Sea Grant Institute 1993). Intertidal beaches are used by several fish species as a spawning site. The Atlantic silverside deposits its eggs in filamentous algae (*Enteromorpha* spp.) or other vegetative material in the upper intertidal zone of saltmarshes and open beaches (Conover and Kynard 1984). The mummichog (*Fundulus heteroclitus*) also deposits eggs in the upper intertidal zone either on stems of Spartina, within empty mussel shells, or amongst filamentous algae (Able and Castagna 1975; Taylor *et al.* 1977). The un-vegetated stretch of sand between MHW and the upper tidal limit is also prime feeding habitat for numerous species of shorebirds, especially during spring and fall migrations, and prime nesting habitat for several beach nesting birds, including piping plover, common and least terns, black skimmer, and American oystercatcher (Bull and Farrand 1977).

## IV. FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

The purpose of consultation under the FWCA is to ensure equal consideration of fish and wildlife resources in the planning of water resource development projects. The Service's emphasis in this regard is to identify means and measures to mitigate the potential adverse impacts of the proposed project and to make positive contributions to fish and wildlife resource problems and opportunities.

This report was prepared concurrently with other Corps' environmental review requirements. From the Service's perspective, a desired output of the proposed project is to ensure the protection of healthy marine, estuarine, and terrestrial ecological communities. Specifically, the Service recommends that conservation of fish and wildlife resources be accomplished by: (1) ensuring that the proposed project evaluate alternatives which achieve and maintain high biological diversity; (2) ensuring natural areas are protected and monitored throughout the life of the project; (3) ensuring construction designs promote high value habitats for Service trust species; (4) establishing conservation easements over the life of the project; and (5) incorporating education and outreach activities to the project to inform the public about the uniqueness and fragility of the coastal ecosystem.

Ultimately, the Service's Mitigation Policy (January 23, 1981, Federal Register v. 46 n. 15 pp. 7644-7663) establishes a number of criteria which, if met, would allow the Service to support a water resource development project. These criteria are:

1) The projects are ecologically sound.
2) The least environmentally damaging alternative is selected.
3) Every reasonable effort has been made to avoid or minimize damage or loss of fish and wildlife resources and uses.
4) All mitigation recommendations have been adopted with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal.
5) For wetlands and shallow water habitats, the proposed activity is clearly water dependent and there is a demonstrated public need.

Presidential Memorandum M-16-01 to federal agencies entitled, "Incorporating Ecosystem Services into Federal Decision Making" dated October 7, 2015, will be a necessary consideration in the recommendations we make concerning this federal planning effort. M-16-01 establishes, "Ecosystem services provide vital contributions to economic and social well-being. These include, but are not limited to, provisioning food and materials, improving the quality and moderating the quantity of water, providing wildlife habitat and spawning and nursery habitats for fisheries, enhancing climate resilience, mitigating storms and floods, buffering pollutants, providing greater resilience for communities and ecosystems, and supporting a wide array of cultural benefits, recreational opportunities, and aesthetic values." Consequently, the President has directed federal agencies to make due consideration of the full range of benefits and tradeoffs among ecosystem services associated with potential federal actions, including benefits and costs that may not be recognized in private markets because of the public-good nature of some ecosystem services. As stated in the M-16-01, an ecosystem-services approach can: (1) more completely inform planning and decisions, (2) preserve and enhance the benefits provided by ecosystems to society, (3) reduce the likelihood of unintended consequences, and, (4) where monetization is appropriate and feasible, promote cost efficiencies and increase returns on investment.

Bear (2014) stated as it relates to the Corps of Engineers' Civil Works Program, "In the Water Resources Development Act of 2007, Congress directed that the 1983 Principles and Guidelines utilized by the U.S. Army Corps of Engineers...be updated to reflect national priorities, including not only economic development but protection of the environment by maximizing sustainable economic development, avoiding the unwise use of floodplains, minimizing adverse impacts when a floodplain or flood-prone area is used, and protection and restoration of natural system functions."

The President's memorandum entitled, "Mitigating Impacts on Natural Resources From Development and Encouraging Related Private Investment" (Federal Register Vol. 80, No. 215 Friday, November 6, 2015) was very recently issued to federal agencies and sets forth a series of directives that will factor into our FWCA and ESA consultations including, but not limited to:

- "Agencies' mitigation policies should establish a net benefit goal or, at a minimum, a no net loss goal for natural resources the agency manages that are important, scarce, or sensitive, or wherever doing so is consistent with agency mission and established natural resource objectives. When a resource's value is determined to be irreplaceable, the preferred means of achieving either of these goals is through avoidance, consistent with applicable legal authorities. Agencies should explicitly consider the extent to which the beneficial environmental outcomes that will be achieved are demonstrably new and would not have occurred in the absence of mitigation (*i.e.* additionality) when determining whether those measures adequately address impacts to natural resources;

- Agencies should set measurable performance standards at the project and program level to assess whether mitigation is effective and should clearly identify the party responsible for all aspects of required mitigation measures. Agencies should develop and use appropriate tools to measure, monitor, and evaluate effectiveness of avoidance, minimization, and compensation policies to better understand and explain to the public how they can be improved over time; and

- When evaluating proposed mitigation measures, agencies should consider the extent to which those measures will address anticipated harm over the long term. To that end, agencies should address the durability of compensation measures, financial assurances, and the resilience of the measures' benefits to potential future environmental change, as well as ecological relevance to adversely affected resources."

The Service also notes that the President's Climate Action Plan seeks to implement "...climate-adaptation strategies that promote resilience in fish and wildlife populations, forests and other plant communities, freshwater resources, and the ocean" (Executive Office of the President 2013).

## V. EVALUATION METHODS

Descriptions of natural resources are based on studies for similar projects, relevant grey and peer-reviewed literature, local, state, and federal fish and wildlife reports and plans, and personal communications with knowledgeable biologists, planners, coastal geologists, and engineers.

In this report, the Service provides a discussion of federal trust resources (i.e., migratory birds, wetlands, endangered species, and anadromous fish), as well as shellfish, for the project area. However, our analysis focuses on migratory birds and wetlands due to the fact that the Corps will likely have to complete an Essential Fish Habitat (EFH) assessment for a number of marine shellfish and finfish species during consultation with NOAA/F, and consultation under the ESA will be required for federally-listed species in the proposed project area.

In developing mitigation recommendations, the Service relied on experience, literature searches, and local, state, and federal conservation plans (e.g., bird conservation plans and local, state, and federal land and water conservation plans), and special designations (*e.g.*, federally- and state-identified Significant Fish and Wildlife Habitat Complexes) to derive appropriate recommendations for mitigation and fish and wildlife enhancement opportunities.

Fish and wildlife enhancement opportunities are presented which represent actions that are recommended as part of existing conservation plans, which would benefit migratory birds and the habitats in the study area that support them.

As discussed in more detail in the following section, this report discusses fish and wildlife resources which use the three major ecological systems (marine, estuarine, and terrestrial) found in the significant land and water complexes of the proposed project area.

## VI. DESCRIPTION OF FISH AND WILDLIFE RESOURCES

### A. Coastal Marine Ecosystem

#### 1. Offshore

The offshore marine community consists of benthic organisms such as worms (*Polygordius triestinus*), sand dollar (*Echinarachnius parma*), small clam (*Tellina agilis*), surf clam, and finfish such as summer flounder (*Paralichthys dentatus*) and little skate (*Raja erinacea*) (U.S. Army Corps of Engineers 1999). Marine mammals such as the harbor seal and sea turtles, such as the leatherback sea turtle, have been reported to utilize the open marine community as well (U.S. Army Corps of Engineers 1999).

As part of the FIMI, Corps' contractors conducted water quality surveys in borrow areas 2C and 5B (portions of which are now proposed to be used for the FIMP) from July through October of 2015 (U.S. Army Corps of Engineers 2016a). Refer to the Corps' DEIS Appendix L for more detailed information regarding these surveys.

Water quality surveys conducted as part of the FIMI provided the following results:

- Salinity ranged from 31.18 parts per thousand (ppt) at the surface in borrow area 2C in July to 33.37 ppt at the ocean bottom in borrow area 5B in October;

- Temperature ranged from 17.10° Celsius (C) at the ocean bottom in borrow area 5B in October to 22.45° C at the surface in borrow area 2C in September;

- Dissolved oxygen (DO) ranged from 5.51 mg/l at the surface in borrow area 5B in August to 8.29 mg/l at the surface of borrow area 2C in July.

Surf clams are a dominant species of inshore benthic infauna and also an important commercial fishery resource. Most surf clam beds off of Long Island occur from the beach zone to a depth of approximately 150 ft (Fay *et al.* 1983). Adult surf clams rarely voluntarily vacate their burrows, usually only being displaced by oceanic storms (Fay *et al.* 1983). The Corps surveys, conducted in August and September of 2001, of 9 sampling areas distributed along the FIMP study area shoreline, indicated that many survey areas had very small or no localized surf clam populations with the exception of areas off of Fire Island Pines and areas east of Shinnecock Inlet (U.S. Army Corps of Engineers 2002). Surf clams were found in the borrow areas 2c (maximum of 2 bushels of clams in one of the survey stations) and in the vicinity of area 4c (FIMP borrow area 4A - maximum of 11 bushels) during these 2001 surveys, but the abundance was relatively low when compared to the borrow 2AD area that had a maximum of 67 bushels. Although these results indicate general trends in surf clam distribution within the FIMP area, these surveys occurred in potential borrow areas and sampling points were not necessarily distributed to quantify surf clam populations for the entire FIMP study area.

More recent surf clam surveys are conducted annually by the NYSDEC, albeit a more regional effort along the south shore of Long Island. Sampling stations occurring within the FIMP study area are present within each of the following ocean stratum/sub areas: 1) Fire Island to Moriches Inlet (FM) 1 - 0-1 mi. from shore; 2) FM2 - 2 mi. from shore; 3) FM3 - 3 mi. from shore; 4) Moriches Inlet to Montauk Point (MM) 1 - 0-1 mi. from shore. The mean catch per unit effort (bushels taken in a three-minute tow) for each stratum in 2012 (the most recent data available) is listed as follows (New York State Department of Environmental Conservation 2013):

FM1: 2.66 bushels
FM2: 0.95 bushels
FM3: 1.01 bushels
MM1: 0.59 bushels

The area along the ocean shoreline between Fire Island and Moriches Inlet had the greatest abundance. For comparison, the stratum with the greatest abundance along the south shore of Long Island was the Jones Inlet to Fire Island Inlet, 0-1 mi. from shore (3.46 bushels). The MM1 stratum had the least abundance of the areas surveyed (New York State Department of Environmental Conservation 2013).

Many benthic macro-invertebrate species within the offshore marine substrate are important prey/forage for commercially and ecologically important finfish species. The Corps conducted benthic invertebrate surveys of potential borrow areas in the fall of 2000 and spring of 2001 (U.S. Army Corps of Engineers 2004a). Dominant species observed in the fall of 2000 included amphipods (*Gammarus oceanicus* and Protohaustorius wigleyi), polychaete worms (*Magelona rosea* and *Tharyx acutus*), archiannelid worms (*Polygordius triestinus*), tanaid/crustaceans (*Leptochelia savignyi*), sand dollars, and bivalves (*Tellina agilis*). Dominant benthic invertebrate species observed during the Spring of 2001 surveys included amphipods (*G. oceanicus*, *P. wigleyi*, and *Amphiporeia gigantean*), Nematoda, archiannelid worms (*P. triestinus*), bivalves (*T. agilis*), and polychaete worms (*Spiophanes bombyx* and *Syllidae* spp.). The Corps concluded that abundances and diversity of benthic invertebrates were generally consistent among borrow areas and between seasons (U.S. Army Corps of Engineers 2004a).

These benthic surveys were supplemented by Corps contractor FIMI surveys of borrow areas 2C and 5B (portions of which are now proposed to be used for the FIMP) from July through October of 2015 (U.S. Army Corps of Engineers 2016a) and comparable to the 2000 and 2001 surveys. During summer surveys, the most abundant benthic species in each borrow area were amphipods, Nematoda and archiannelid worms while in the fall, the most abundant species were archiannelid worms, amphipods and Nematoda in borrow area 2C and Nematoda, amphipods, and archiannelid worms in borrow area 5B. Refer to the Corps' DEIS - Appendix L for more detailed information regarding these surveys (U.S. Army Corps of Engineers 2016a).

Dominant fish species observed during Corps' surveys of 4 potential borrow areas in 1999-2002 included Atlantic silverside (*Menidia menidia*), striped anchovy (*Anchoa hepsetus*), bay anchovy (*A. mitchilli*), spotted hake (*Urophycis regia*), butterfish (*Peprilus triacanthus*), scup (*Stenotomus chrysops*), Atlantic herring (*Clupea harengus*), silver hake (*Merluccius bilinearis*), winter flounder (*Pseudopleuronectes americanus*), winter skate (*Raja ocellata*), and little skate (U.S. Army Corps of Engineers 2004b). The Corps found that the greatest abundance of finfish occurred in the fall months at depths greater than 30 ft and that the off-shore bottom predominantly consisted uniformly of sand. A review of the Corps' finfish database indicate that the areas within the vicinity of Shinnecock Inlet and borrow area 2b (offshore of Fire Island Pines) had the highest diversity of finfish species (U.S. Army Corps of Engineers 2004b).

The Corps also surveyed the same four borrow areas for squid (*Teuthida* spp.), a carnivore that feeds upon small fish, crustaceans, benthic worms, and shrimp, that is an important commercial fishery resource and prey species for many finfish species, including bluefish and silver hake. Squid were observed at each of the borrow areas with the greatest numbers occurring in the fall months (U.S. Army Corps of Engineers 2004b). Squid abundance appears to be evenly distributed, except for a slightly higher abundance at the Shinnecock borrow area in the summer and borrow area 2c (offshore of Sailors Haven) in the winter and spring.

These fish/squid surveys were supplemented by Corps contractor FIMI surveys of borrow areas 2C and 5B from July through October of 2015 (U.S. Army Corps of Engineers 2016a). The most abundant species in each borrow area throughout all the months sampled included squid, northern sea robin (*Prionotus carolinus*) and scup while the species with the greatest biomass included the winter skate, clearnose skate (*Raja eglanteria*) and northern searobin. Refer to the Corps' DEIS Appendix L for more detailed information regarding these surveys (U.S. Army Corps of Engineers 2016a).

<u>Artificial Reefs</u>

The NYSDEC Division of Marine Resources develops and manages artificial reefs to provide fishing opportunities for fish species that frequent hard bottom habitat. These species include tautog, black sea bass (*Centropristis striata*), and scup (New York State Department of Environmental Conservation 2006). Artificial reefs present within the FIMP study area include:

Fisherman (Great South Bay, 1.0 nautical mi. northeast of the Robert Moses water tower);

Kismet (Great South Bay, north of Kismet);

Fire Island (Atlantic Ocean, 1.8 nautical mi. south of Fire Island Lighthouse);

Moriches (Atlantic Ocean, 2.1 nautical mi. south of Moriches Inlet), proposed to be significantly expanded from 14 to over 400 ac.; and

Shinnecock (Atlantic Ocean, 2.0 nautical mi. south of Shinnecock Inlet) proposed to be significantly expanded from 35 to over 400 ac.

These reefs consist of red shale, jetty stone, barges, ship hulls, and buoy anchors.

Essential Fish Habitat (EFH)

The EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) authorize the National Oceanic and Atmospheric Administration (NOAA) to evaluate development projects proposed or licensed by federal agencies, including the Corps. If coastal development projects have the potential to adversely affect marine, estuarine, or anadromous species or their habitat, the NOAA makes recommendations on how to avoid, minimize, or compensate these impacts (NOAA website http://www.nero.noaa.gov/hcd/webintro.html).

The MSFCMA also establishes measures to protect EFH. The NOAA must coordinate with other Federal agencies to conserve and enhance EFH, and federal agencies must consult with NOAA on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH. In turn, NOAA must provide recommendations to federal and state agencies on such activities to conserve EFH. These recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded, or undertaken by that agency.

The EFH areas are depicted in NOAA's website http://www.nero.noaa.gov/hcd/webintro.html). Several of the dominant species discussed above are designated as EFH species by the NOAA, including the Atlantic butterfish, scup, and winter flounder. The Corps will need to complete EFH consultation with the NOAA for this project.

2. Nearshore

The Service (U.S. Fish and Wildlife Service 1996) defines the nearshore zone as the aquatic area between the offshore 20-m depth contour and the MLW line. The nearshore bottom is a gently sloping terrace composed of a uniform sand sediment surface (U.S. Fish and Wildlife Service 1996b). The NYSDEC's New York Natural Heritage Program (NYNHP) defines the community within this area as the Marine Deepwater Community (New York Natural Heritage Program 2002).

The nearshore community within the project area is also a sandy, sparsely vegetated aquatic community dominated by benthic organisms such as the polychaete worm (*Mageloma papillicornis*) and dwarf tellin (Tellina agilisa), and sea turtles, such as the Kemp's ridley sea turtle (U.S. Army Corps of Engineers 1999). Finfish observed in the nearshore zone include bluefish, striped bass (*Morone saxitilis*), alewife, Atlantic menhaden (*Brevoortia tyrannus*), northern kingfish (*Menticirrhus saxatilis*), and striped sea robin (*Prionotus evolans*) (U.S. Fish and Wildlife Service 1981a).

The Service's Significant Habitats and Habitat Complexes of the New York Bight Watershed Report (SHCR) identifies the Montauk Peninsula as a significant habitat, specifically the nearshore open waters which provide regionally significant and critical wintering waterfowl habitat and extensive beds of blue mussel and kelp.

The NYSDOS has designated Montauk Point shoals as a Significant Coastal Fish and Wildlife Habitat (New York State Department of State website: http://www.nyswaterfronts.com/downloads/pdfs/sig_hab/LongIsland/Montauk_Point_Shoals.pdf (see Figure 6).

3. Marine Intertidal

The marine intertidal gravel/sand beach community is characterized by tidal or wave inundation and has sand or gravel substrates (New York Natural Heritage Program 2002; U.S. Army Corps of Engineers 2016). This community is present along the majority of the Atlantic shoreline within the FIMP study area. The marine rocky intertidal community is also influenced by tidal and wave inundation, but its substrate consists of boulders/rocks. This community is present in the eastern portion of the FIMP study area, specifically along the south shore of the Montauk Peninsula (New York Natural Heritage Program 2002). The marine riprap/artificial shore community is present at the groins and jetties located along the FIMP area, Atlantic Ocean shoreline, including the jetties at Fire Island, Moriches, and Shinnecock Inlets, and groins at Westhampton Beach.

**Corps Surveys**

East of Shinnecock Inlet

The Corps contracted EEA, Inc. to survey benthic invertebrates from Shinnecock Inlet east to Montauk Point (a total of 24 transects), within the marine intertidal community, from the wrack line, mid-tide zone and surf zone. The survey was segmented into four reaches: the Montauk Headlands (described as shorelines with large boulders and rocks on short beaches below heavily eroded bluffs), Ditch Plains (described as areas with sandy beaches and areas with rocks and boulders), Coastal Ponds (in front of Mecox Bay, Sagaponack Pond, and Georgica Pond, described as being influenced by washout events and materials from the ponds), and east of Shinnecock Inlet (described as sandy beach). Surveys were conducted in May and November/December of 2000 (EEA, Inc. 2003a).

May 2000

East of Shinnecock Inlet – Polychaete worms (*Scolelpis squamata*), and amphipods (*Gammarus oceanicus* and *Amphipoda* spp.) were the dominant species, both found more in the mid-tide zone.

Coastal Ponds – Nematoda (*Nematoda* spp.) found in the wrack line and mid-tide zones, polychaete worms (*Scolelpis squamata*), found more in the surf and mid-tide zones, and bivalves/blue mussel found in the mid-tide zones, were the dominant species.

Ditch Plains – Blue mussel, found primarily in the mid-tide and surf zones, was most dominant, followed by polychaete worms (*Scolelpis squamata*), found more in the surf and mid-tide zones and amphipods, found in the wrack line and surf zone.

Montauk Headlands – Blue mussel, found primarily in the mid-tide and surf zones, was most dominant, followed by amphipod species, found primarily in the surf zone, and Gastropoda (*Littorina littorea*), found in the mid-tide zone.

November/December 2000

*East of Shinnecock Inlet* – Amphipods (*Gammarus oceanicus*), found primarily in the mid-tide and surf zones, were most dominant, followed by polychaete worms (*Scolelpis squamata*), found in the surf zone.

*Coastal Ponds* – Polychaete worms (*Scolelpis squamata*), found in the mid-tide and surf zones, were most dominant, followed by Nematoda (*Nematoda* spp.), found in the mid-tide zone.

*Ditch Plains* – Polychaete worms (*Scolelpis squamata*, *Ophelia bicornis*), found primarily in the mid-tide and surf zones, were most dominant, followed by Nematoda (*Nematoda* spp.), found in the wrack line.

*Montauk Headlands* – Polychaete worms (*Ophelia bicornis*, *Glycera* spp.), found primarily in the surf zone, were most dominant, followed by Nematoda (*Nematoda* spp.), found in the wrack line.

EEA, Inc. concluded that: a) abundance and diversity of infauna generally increased from west to east; b) most biomass was attributable to polychaete worms, with the exception of the Montauk Headlands Reach, where mollusks and periwinkle (*Littorina littorea*) were dominant; c) surf and mid-tide zones had higher abundances than the wrack line; and d) organisms in the eastern reaches (Ditch Plains and Montauk Point) were dissimilar to those in the western reaches (Shinnecock Inlet east and the Coastal Ponds) (EEA, Inc. 2003a).

EEA, Inc. also compared their results with previous studies of ocean shoreline benthic infauna conducted on Fire Island (Kluft 1999), Westhampton Beach (EEA, Inc. 1999), and along the New Jersey shoreline (Vittor 1999). EEA, Inc. concluded that their study findings were similar to those on the Long Island barrier beaches but differed from those on New Jersey beaches, where Rhyncocoela (nemertean worms – *Nemertean* spp.) was dominant and overall abundances were higher, as were the number of sampling stations (twice as many). The nemertean worms, which live under rocks or burrow in soft substrates, were rarely collected in EEA, Inc.'s efforts and none were collected in the Fire Island study. It was not clear to EEA, Inc. why this species was found in large numbers in some areas and not in others (EEA, Inc. 2003a).

EEA, Inc. observed extensive tire ruts across the western beaches of the study area (just east of Shinnecock Inlet). These areas were open to vehicular traffic, which may have accounted for the low numbers of organisms observed in the wrackline zone (EEA, Inc. 2003a).

Refer to EEA, Inc. 2003a for a complete listing of species observed and a more comprehensive discussion of study findings.

West of Shinnecock Inlet

The Corps beach invertebrate surveys were conducted at twelve locations from Fire Island to Shinnecock Inlets in the Spring and Fall of 2003, using benthic cores, wrackline observations and pitfall traps (discussed in the Marine Beach community section). Overall, dominant species observed in benthic cores included oligochaeta, nematoda, and blue mussel. In the spring, oliochaeta and nematoda were dominant in the low, mid, and high tide zones and the wrack line, while blue mussel and turbellaria flatworms were dominant only in the low tide zone. In the fall, oliochaeta and nematoda were dominant in each portion of the intertidal area, with oliochaeta being more dominant in the upper zones (high tide and wrack line) and Nematoda being more dominant in the lower zones (low, mid, and high tide zones). Dominant wrack line organisms observed included springtail (*Anurida maritima*), bivalves, amphipod beach fleas, and common sea star (*Asterias forbesii*). The total number of benthic organisms appeared to fluctuate randomly along a west-to-east gradient, while the stations fronting Shinnecock Bay had the highest mean abundance (U.S. Army Corps of Engineers 2005a). There was a greater abundance of benthic organisms observed in the fall. In the spring, benthic organism abundance was highest at the mid-tide zone while abundance was more evenly distributed in the fall.

A comparison of the findings of this study and the study of the eastern portion of the FIMP study area described above, indicated seasonal similarities in abundances and taxa, but differences along the transects. In this study of the western portion of the study area, there were a higher number of benthic invertebrates found in the high tide line and wrack locations, while the study of the eastern portion of the study area showed higher organism abundances in the mid and surf zones than the wrack (U.S. Army Corps of Engineers 2005a). This phenomenon may be due to the fact that the shoreline of the eastern portion of the study area, primarily Montauk Point and Ditch Plains, is armored with stones, boulders, and coarse sand, while the western portions consist of sand. Additionally, off-road vehicle (ORV) traffic affects wrackline abundances.

Refer to U.S. Army Corps of Engineers 2005a for a complete listing of species observed and a more comprehensive discussion of study findings.

## B. Ocean Beach and Dune Ecosystem

1. Marine Beach

### Vegetation

Landward of the sandy intertidal zone is the maritime beach community that is typically dominated by American beachgrass (*Ammophila breviligulata*), sea-rocket (*Cakile edentula*), seaside goldenrod, seaside spurge (*Chamaesyce polygonifolia*), and the federally-listed (threatened) seabeach amaranth (New York Natural Heritage Program 2002).

The NPS-FIIS, USGS, NYNHP, The Nature Conservancy (TNC), and Conservation Management Institute completed the mapping of vegetation within the FIIS in 2002 (Conservation Management Institute 2002). These maps (too large to be incorporated into this document) are available at http://biology.usgs.gov/npsveg/fiis/index.html. Dominant species observed in this effort within the Marine Beach habitat (classified as North Atlantic Upper Ocean Beach in their report) included American beachgrass, seaside goldenrod, and beach pea (*Lathyrus japonicus*).

**Benthic Species**

Dominant species/taxa observed in pitfall traps (in the wrackline, supratidal, and grass zones) from above-described surveys conducted in the spring and fall of 2003, included brine fly (*Ephydridae* spp.) and ground beetle (Clivinia spp.), beach flea amphipods (*Talorchestia longicornis* and *T. megalopthalma*), and incidental collections of blue mussel (U.S. Army Corps of Engineers 2005a). In the spring, *T. longicornis* was more dominant while *T. megalopthalma* was more dominant in the fall. Generally, *T. longicornis* was more dominant in the wrack line and supratidal zone while *T. megalopthalma* was more dominant in the grass zone. There was a greater abundance of invertebrates captured/observed in the spring than the fall, with the greatest abundance along the beaches fronting the Great South Bay (Old Inlet).

**Significant Habitats**

The Service's Significant Habitat and Habitat Complexes of the New York Bight Watershed Report identifies sandy beach areas within the following significant habitat complexes:

<u>Montauk Peninsula</u>

*Napeague Beach* – One of the largest undeveloped beach and back dune ecosystems. This complex also a NYSDOS-designated significant habitat.

<u>South Fork Atlantic Beaches</u>

*Gin Lane Beach* – Federally-listed seabeach amaranth present.

*Atlantic Double Dunes* – Undeveloped beach and dune ecosystem with extensive dunes and maritime interdunal swale communities. This complex also a NYSDOS-designated significant habitat.

<u>Shinnecock Bay</u>

*Tiana Beach and Southampton Beach* – Support significant nesting habitat for the State-listed least tern and federally-listed piping plover.

<u>Moriches Bay</u>

*Smith Point County Park, Pikes Beach, Westhampton Beach, and Cupsogue County Park* – Piping plovers and least terns nest on these sandy beaches and harbor seals haul-out at Cupsogue County Park in the winter.

Great South Bay

*Democrat Point, FIIS Wilderness Area* – Piping plovers and least terns nest and seabeach amaranth grows on these sandy beaches.

The following New York State Department of State- (NYSDOS) designated Significant Coastal Habitats (SCH) are present within this zone (excerpts from NYSDOS web-site):

Atlantic Double Dunes

The fish and wildlife habitat extends approximately 2.5 mi. along the coast, from Old Beach Lane in the Village of East Hampton to Beach Avenue in Amagansett, and includes the Amagansett NWR. This approximate 280 ac area consists of open sandy beach (the Maidstone Club Beach and Amagansett Beach) and a relatively undisturbed interdunal area situated between the primary dune and residential development along the south side of Further Lane and Bluff Road. Atlantic Double Dunes is one of the largest remaining areas of undeveloped barrier beach and back dune ecosystem on Long Island, representing a rare ecosystem type in New York State.

Mecox Beach

The beach occurs in the dynamic area between the coastal pond and ocean and is an important nesting area for least terns and piping plovers.

Smith Point County Park

Smith Point County Park is one of the largest segments of undeveloped barrier beach on Long Island, comprising a rare ecosystem type in New York State. This area contains the largest extent of saltmarsh in Moriches Bay, and is an important habitat for many fish and wildlife species throughout the year. Piping plovers nest on the upper beach. The dunelands at Smith Point County Park comprise a significant segment of the fall migration corridor for raptors moving south along the Atlantic Coast. Undeveloped dune areas such as this provide critical feeding and resting areas for thousands of migrating raptors each year.

As stated above, Hurricane Sandy created overwash deposits, east of the TWA Flight 800 Memorial at Smith Point County Park (Hapke *et al.* 2013). However, the FIMI project stabilized/altered much of the habitat created there, although mitigation/restoration sites have been constructed to mimic natural features and are being assessed by the Corps and the Service to assess their success.

Three breaches formed on Fire Island at Smith Point (40.750156N, -72.811806W), Old Inlet (40.723509N, -72.894704W), and eastern Fire Island Pines (40.667489N, -73.055264W). The breach at Smith Point was a relatively small breach that did not appear to exhibit exchange of ocean and bay waters at low tide (Papa, U.S. Fish and Wildlife Service, personal observation), but was closed by the Corps under the provisions of the Corps' BCP in December 2012.

<u>Cupsogue County Park</u>

Cupsogue County Park is an important segment of undeveloped barrier beach on Long Island. This area is a valuable habitat for a variety of wildlife species, including foraging and breeding habitat for least terns and piping plovers. Barrier beach dunelands, such as that found on Cupsogue County Park, are also essential resting and feeding areas for migrating raptors, especially falcons and accipiters, which move south through a very narrow corridor along the south shore. These birds forage extensively among the undeveloped barrier beaches, where concentrations of small mammals, migrant shorebirds, and passerine birds provide an important prey base. The wetland areas in Cupsogue County Park are valuable feeding areas for a variety of shorebirds and waterfowl throughout the year, and contribute significantly to the biological productivity of Moriches Bay.

**Corps Avian Surveys**

The Corps conducted a 1-year survey of avian species within the FIMP study, specifically along the barrier islands from Fire Island Inlet to just east of Shinnecock Inlet, along 20 transects from May 2002-May 2003 (U.S. Army Corps of Engineers 2003). Beach habitat, including intertidal and supratidal areas, consisted of the largest percentage of habitat surveyed. Dominant species observed during these surveys include:

Black-bellied plover (*Pluvialis squatarola*; forages in beach habitat during winter and migration);
Dunlin (*Calidris alpine*; forages in beach habitat during winter and migration);
Great black-backed gull (year-round foraging);
Herring gull (year-round foraging);
Least tern (forages and breeds in spring/summer);
Piping plover (forages and breeds in spring/summer);
Sanderling (forages during winter and migration).

Other species regularly observed in the beach habitat include the American oystercatcher, which forages and breeds in the spring/summer, and semi-palmated plover, which forages during migration.

The Service conducted avian surveys for the FIMP project from May-July of 1982, from Moriches Inlet to Montauk Point. These surveys identified many of the above listed species as dominant in the marine beach habitat, as well as the American kestrel and horned lark, both year-round residents (U.S. Fish and Wildlife Service 1983).

**Federally- and State-listed Species**

Beach habitat also provides essential foraging and nesting habitats for nesting waterbirds, including the federally-listed threatened piping plover, endangered roseate tern, and State-listed threatened least tern, common tern, and species of special concern black skimmer. The federally-listed red knot (*Calidris canutus rufa*; threatened) utilizes sandy beaches within the FIMP study area as stopover/foraging habitat during spring and fall migrations. However, this species is more concentrated in areas where horseshoe crab eggs and bivalves are available for forage, which is in the bay intertidal habitat discussed more below. Seabeach amaranth is a federally-listed (threatened) plant that grows in this habitat.

Within the FIMP area, the piping plover and least tern nest in Marine Beach and Dune and Swale, Terrestrial Upland, bayside beach and bay island habitats along the ocean shoreline, and back-bay areas as well. Plovers forage on invertebrates primarily along the ocean and bay shorelines, while the least tern forages for fish in ocean and bay open waters. The roseate and common terns breed on bay islands and forage for fish in ocean and bay open waters. Common terns nest within the FIMP study while roseate terns had historically, but not within the last 5 years. Black skimmers also had historically nested within the FIMP study area on bay islands in tern colonies although they have not nested recently within the FIMP project area in the last 5 years. Black skimmers forage in ocean and bay waters for fish.

Seabeach amaranth only grows on sparsely vegetated ocean beaches (U.S. Fish and Wildlife Service 1996a). This annual plant usually grows on the ocean beaches within the FIMP study area with greater concentrations in the western and central portions.

A summary of population trends for these species (NYSDEC Long Island Colonial Waterbird and Piping Plover data) that breed within New York State (Long Island) are listed as follows (2015 data not yet available at the time of the preparation of this document):

Table 1. Federally- and New York State-listed Species on Long Island/NY

| **Species (1 = No. of Pairs; 2 = No. of Breeding Individuals)** | | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **Piping Plover1** | **Roseate Tern1** | **Common Tern2** | **Least Tern2** | **Black Skimmer2** | **Seabeach Amaranth *** |
| **2000** | 289 | 2104 | 19,664 | 2,103 | 331 | 138,600 |
| **2001** | 309 | 1815 | 17,499 | 2,737 | 512 | 179,300 |
| **2002** | 369 | 1853 | 15,790 | 3,267 | 491 | 190,500 |
| **2003** | 386 | 1938 | 18,405 | 2,678 | 378 | 112,128 |
| **2004** | 384 | 1804 | 19,116 | 2,069 | 265 | 30,831 |
| **2005** | 374 | 1380 | 19,330 | 3,382 | 418 | 16,813 |
| **2006** | 422 | 1835 | 20,097 | 2,798 | 390 | 32,473 |
| **2007** | 456 | 1,832 | 17,548 | 2,792 | 483 | 3,914 |
| **2008** | 472 | 1324 | 21,441 | 3,669 | 622 | 4,416 |
| **2009** | 475 | 1328 | 17463 | 2817 | 690 | 5,402 |
| **2010** | 428 | 1315 | 18,177 | 2832 | 589 | 534 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **2011** | 334 | 1505 | 8,161 | 2311 | 538 | 2,662 |
| **2012** | 391 | 1501 | 15,616 | 1720 | 508 | 1,213 |
| **2013** | 344 | 1,544 | 17,453 | 2,281 | 557 | 729 |
| **2014** | 309 | 1,610 | 6,559 | 1,804 | 768 | 902 |
| * Number of plants | | | | | | |

Plover populations on Long Island steadily increased from the year 2000, peaking in 2009, then dropped significantly in 2011 and 2014. Populations numbers in 2015 (still preliminary) indicate a slight increase from 2014 (New York State Department of Environmental Conservation 2015b). Roseate tern populations on Long Island were relatively stable from 2000-2004, but dropped in 2005 and 2008-2010, but have been on the rebound since 2011. Seabeach amaranth numbers plummeted in 2004, and have remained low, with modest fluctuations since then.

A more detailed assessment of the piping plover, seabeach amaranth, roseate tern and red knot will be completed during the ESA section 7 consultation.

There is a fourteen year downward trend in common tern and least tern populations across Long Island. While the trend for black skimmers in this time period is an increase in the total population, the number of colonies has sharply decreased Long Island-wide, but specifically within the FIMP area from 12 in 1980 to none in 2015 (New York State Department of Environmental Conservation 2015b).

Although not a federally or state-listed species, the American oystercatcher (Haematopus palliates) is a ground-nesting shorebird which breeds within the ocean beach, dunes and swales, terrestrial upland, bayside beach, and bay island habitats that many federally and State-listed ground-nesting shorebird species breed in within the FIMP.

Limiting factors in shorebird productivity include disturbances from recreational activities, flooding/inundation of nests, predation, beach stabilization practices, and loss of habitat from development. Limiting factors in seabeach amaranth growth include trampling from off-road vehicles and/or pedestrians, loss of habitat from development, beach stabilization practices which promote dense beach grass growth, burial of seed banks, and competition with perennial plants as beach habitat is stabilized (U.S. Fish and Wildlife Service 1996a).

2. Dunes and Swales

**Vegetation**

The vegetated beach community consists of the vegetated dune and back-dune areas which are dominated by American beachgrass, bayberry (*Myrica pennsylvanica*), dusty miller, beach plum (*Prunus maritima*), beach heath (*Hudsonia tomentosa*), beach pea (*Lathyrus japonicus*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Rhus radicans*), and common saltwort (*Salsola kali*).

The NPS-FIIS vegetation mapping efforts (Conservation Management Institute 2002) designated several vegetation classes/communities present within dunes and swales, listed in Table 2.

Table 2. NPS-FIIS Dunes and Swales Vegetative Communities of Fire Island

| Vegetation Class/Community | Description | Dominant Species |
|---|---|---|
| Northern Beach Grass Dune | Perhaps the most prevalent on Fire Island. It is found on the ocean side of the interdunal area from the crest through the high saltmarsh | American beachgrass, seaside goldenrod |
| Overwash Dune Grassland | Occurs on recent overwash areas near the foredune | American beachgrass |
| Brackish Interdunal Swale | Found behind primary and secondary dunes where saline surface water is found | Three square bulrush (*Scirpus pungens*), saltmeadow cordgrass (*Spartina patens*) |
| Northern Sandplain Grassland | Rare and limited to the wider parts of the Otis Pike Wilderness Area | Bayberry |
| Beach Heather Dune | Widespread on Fire Island and is found from Fire Island Inlet to the Moriches Inlet predominantly in the interdunal zone | Beach heather (*Hudsonia tomentosa*), American beachgrass |
| Northern Interdunal Cranberry Swale | Found in the interdunal zone as small, pond-like bodies of shallow water | Cranberry (*Vaccinium macrocarpon*), highbush blueberry (*V. corymbosum*), Canadian rush (*Juncus canadensis*) |
| Northern Dune Shrubland | Dominates the interdunal areas on Fire Island | Beach plum, American beachgrass, bayberry |
| Maritime Vine Dune | Located on dunes | Poison Ivy, greenbrier (*Smilax rotundifolia*) |
| Highbush Blueberry Shrub Forest | Located in noticeable depressions or swales throughout the interdunal area | Juneberry (*Amelanchier canadensis*), Swamp azalea (*Rhododendron viscosum*), Highbush blueberry |

Many of these communities are present along the Westhampton and Southampton barrier islands within the FIMP study area as well.

**Significant Habitats**

The Service's SHCR identifies dune grassland areas within the following significant habitat complexes:

<u>Montauk Peninsula</u>

Easthampton Heathland – One of the largest remaining maritime heathlands in New York.
Shadmoor Ditch Plains – Maritime grassland which provides habitat for the federally-listed sandplain gerardia (*Agalinus acuta*).

The sandy beach designated by the SHCR and NYSDOS also have dune grasslands present.

**Migrating Hawks**

Hawks migrate along the south shore of Long Island above the dunes and swales each fall. Since 1982, the Fire Island Raptor Enumerators (FIRE) organization has conducted annual surveys of these migrating hawks, at a station located at the eastern portion of RMSP, and provides annual data on their website (http://www.battaly.com/fire/). Dominant species observed by FIRE include: the osprey (*Pandion haliaetus*), northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), American kestrel (*Falco sparverius*), and merlin (*F. columbarius*). The FIRE's annual data indicates significant variations from year to year, perhaps due to inclement weather, changes in migration patterns, and/or hawk movements when surveyors were not present.

**Corps Avian Surveys**

Dominant species observed within the dune/swale habitats during Corps surveys (U.S. Army Corps of Engineers 2003) from May 2002-May 2003 included:

Brown-headed cowbird (*Molothrus ater*; year-round resident);
Common yellowthroat (*Geothlypis trichas*; summer resident; spring and fall migrant);
Mourning dove (*Zenaida macroura*; year-round resident);
Dark-eyed junco (*Junco hyemalis*; winter resident; spring and fall migrant);
Northern mockingbird (*Mimus polyglottos*; year-round resident);
Rufous-sided towhee (*Pipilo erythrophthalmus*; year-round resident);
Red-winged blackbird (year-round resident);
Sharp-tailed sparrow (year-round resident);
Song sparrow (*Milospiza melodia*; year-round resident); and
Yellow-rumped warbler (*Dendroica coronata*; winter resident; spring and fall migrant).

Piping plovers, common terns, black skimmers, and least terns will potentially also nest in blow-out or overwashed areas within dune/swale areas.

The Service conducted avian surveys for the FIMP project from May-July of 1982, from Moriches Inlet to Montauk Point. These surveys identified many of the above listed species as dominant in the dune and swale habitats, as well as the grasshopper sparrow (*Ammodramus savannarum*) (U.S. Fish and Wildlife Service 1983).

**Corps Small Mammal and Herpetile Surveys**

The Corps conducted small mammal and herpetile (reptiles and amphibians) surveys in May through August of 2002. The white-footed mouse (*Peromyscus leucopus*) and meadow vole (*Pennsylvaniana maniculatus*) were the most dominant small mammals observed in the dune and swale habitats. Other mammals observed within this habitat include the house mouse (*Mus musculus*), white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), and red fox (*Vulpes vulpes*). The eastern garter snake (*Thamnophis sirtalis*) and Fowler's toad

(*Bufo woodhousei*) were the only herpetiles observed within this habitat (U.S. Army Corps of Engineers 2004c).

The Corps' herpetile surveys echo the findings of the Service in herpetile surveys conducted in April-July 1982 for the FIMP study (from Moriches Inlet to Montauk Point), in which the Fowler's toad and eastern garter snake were dominant (U.S. Fish and Wildlife Service 1983). An additional species observed during Service surveys within dune and swale habitats was the eastern spadefoot toad (*Scaphiopus holbrookii*).

## C. Barrier Island Ecosystem

### 1. Terrestrial Upland

**Vegetation**

The NPS-FIIS vegetation mapping efforts (Conservation Management Institute 2002) designated several vegetation classes/communities present within the terrestrial uplands, listed in Table 3.

Table 3. NPS-FIIS Terrestrial Vegetative Communities of Fire Island

| Vegetation Class/Community | Description | Dominant Species |
|---|---|---|
| Maritime Holly Forest | Occurs just behind (landward of) the backdune | American holly (*Ilex opaca*), shadblow serviceberry (*Amelanchier canadensis*), sassafras, black gum (*Nyssa sylvatica*), black cherry, and pitch pine (*Pinus rigida*) |
| Old Field Red-Cedar Forest | Found on William Floyd Estate. Individual trees are smaller-crowned and scattered in with hardwoods | Red cedar (*Juniperus virginiana*), autumn olive (*Eleagnus umbellate*), and winged sumac (*Rhus copallina*) |
| Maritime Post Oak Forest | Limited to the edge of waterways on the William Floyd Estate | Black oak (*Quercus velutina*), post oak (*Q. stellata*), and northern bayberry |
| Coastal Oak-Heath Forest | Covers a large portion of the William Floyd Estate | Black oak, white oak (*Quercus alba*), mockernut hickory (*Carya tomentosa*), and lowbush blueberry (*Vaccinium pallidum*) |
| Acidic Red Maple Basin Swamp Forest | Found on both the Floyd Estate and Fire Island | Black gum, red maple (*Acer rubrum*), highbush blueberry, and swamp azalea |
| Japanese Black Pine Forest | Found in many isolated patches on Fire Island. It is often used to stabilize the fore dune – especially on the eastern end of the island and around human communities. | Japanese black pine (*Pinus thunbergii*), pitch pine (*Pinus rigida*), and switchgrass (*Panicum virgatum*) |
| Pitch Pine Woodland | Found throughout Fire Island behind the primary dune | Pitch pine, northern bayberry, switchgrass |
| Maritime Deciduous Scrub Forest | Found on the bay side, often behind a large primary dune on wider parts of the island | Mockernut hickory, black oak, sassafras, northern bayberry, Pennsylvania sedge (*Carex pennsylvanica*) |

**Bayside Beach**

Bayside shorelines within the FIMP vary, with many areas transitioning from terrestrial upland habitat to tidal marsh, while some bay shoreline transitions from dune habitat to open sand shoreline (bayside beach). This habitat is sparsely-vegetated, with beach grass dune habitat present landward of the shoreline. The bayside beach habitat is an important habitat for many wading birds and is breeding habitat for the diamondback terrapin.

**White-tailed Deer Status**

The white-tailed deer population on Fire Island has grown dramatically since 1983. Deer density in the eastern half of the island appears to have stabilized at 25-35 deer/square kilometers ($km^2$) while densities are 3-4 times higher in the western half within residential communities (Underwood 2005). Deer can have a significant impact on vegetation that they browse upon, most evident in Sunken Forest, where the herbaceous layer is sparse (Underwood 2005). Deer populations on the mainland of Long Island and at FIIS has increased dramatically since the early 1980s and is impacting local flora, including the globally rare maritime holly forest at Sunken Forest (National Park Service 2009). NYSDEC hunting season forecasts indicate that deer populations in Suffolk County are above desired levels (website- http://www.dec.ny.gov/outdoor/37304.html). In East Hampton, the uncontrolled explosion in the deer population has reached an emergency level according to the Deer Management Working Group (Town of Easthampton 2013).

**Mainland Upland/Wetlands**

Long Island occurs within the Atlantic coastal plains (U.S. Fish and Wildlife Service 1996). The Mainland Upland is variable in land use, with many areas consisting of disturbed uplands consisting of commercial and recreational development. Representative "natural/undisturbed" areas occur in federal, state, and local parks/refuges. Communities present in the FIMP study area mainland include successional Old Field/Shrubland (William Floyd Estate); Coastal Oak/Heath Forest (Seatuck and Wertheim NWRs), Red Maple/Black Gum Swamp, Freshwater Tidal Marsh (Wertheim NWR), Tidal Marsh (low saltmarsh/brackish meadow/salt shrub/high saltmarsh, Suffolk County Islip Meadows, Wertheim NWR).

Successional Old Field/Shrubland is dominated by red cedar, with other canopy associates including black cherry and black oak in the overstory. The shrub layer is dominated by autumn olive, shadblow serviceberry, winged sumac, red cedar, and post oak, prickly dewberry (*Rubus flagellaris*), highbush blueberry, and greenbrier also occurs in the vine layer. The herbaceous layer is dominated by red fescue grass (*Festuca rubra*), common mullein (*Verbascum thapsus*), wild rye (*Elymus virginicus*), and panic grass (*Panicum acuminatum*) (Conservation Management Institute 2002). Characteristic wildlife includes the brown thrasher, warblers (*Dendroica* spp.), eastern towhee, field sparrow, red-tailed hawk, red fox, and white-tailed deer (New York Natural Heritage Program 2002).

The Coastal Oak/Heath Forest community is dominated by black oak, white oak, and pitch pine in the overstory, lowbush blueberry and black huckleberry (*Gaylussacia baccata*) in the understory, and greenbrier, wintergreen (*Gaultheria procumbens*), and Pennsylvania sedge in the herbaceous layer (New York State Department of Conservation 2002). Characteristic wildlife includes the redback salamander (*Plethodon cinereus*), eastern towhee, black-capped chickadee (*Parus atricapillus*), sharp-shinned hawk, and white-tailed deer (Hofstra University website: http://people.hofstra.edu/Russell_L_Burke/HerpKey/index.htm).

The Red Maple Swamp-Black Gum Swamp is dominated by red maple, black gum, and pitch pine in the overstory, sweet pepperbush (*Clethra alnifolia*), highbush blueberry, swamp azalea, and spicebush (*Lindera benzoin*) in the shrub layer, and greenbrier, poison ivy, skunk cabbage (*Symplocarpus foetidus*), and cinnamon fern (*Osmunda cinnamomea*) in the herbaceous layer (New York State Department of Conservation 2002). Characteristic wildlife include the yellow warbler (*Dendroica petechia*), hairy woodpecker (*Picoides villosus*), red-shouldered hawk, eastern painted turtle (*Chrysemys picta picta*), and spotted salamander (*Ambystoma maculatum*) (Hofstra University website: http://people.hofstra.edu/Russell_L_Burke/HerpKey/index.htm).

The Tidal Marsh is variable in dominant species, depending upon the intrusion of invasive species and hydrology. Low saltmarsh is dominated by smooth cordgrass (*Spartina alterniflora*) and glasswort, the brackish meadow is dominated by saltmeadow cordgrass (*S. patens*), switchgrass, and sedge (*Carex silicea*). The salt shrub community is dominated by groundsel-tree (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), saltmeadow cordgrass, and switchgrass. The high saltmarsh is dominated by saltmeadow cordgrass, spikegrass (*Distichlis spicata*), glasswort, and sea lavender (*Agalinus maritima*) (New York Natural Heritage Program 2002). With the exception of the low marsh, many of these communities have been invaded by common reed. Characteristic wildlife in lower areas include willet, seaside sparrow, fiddler crab (*Uca pugilator*), ribbed mussel (*Geukensia dimissa*), and mummichog. Characteristic wildlife in higher areas include coffeabean snail (*Melampus bidentatus*), sharp-tailed sparrow, marsh wren, eastern meadowlark (*Sturnella magna*), clapper rail, American black duck, and northern harrier (New York Natural Heritage Program 2002).

**Corps Avian Surveys**

Dominant species observed within forest habitats during Corps surveys (U.S. Army Corps of Engineers 2003) from May 2002-May 2003 include:

American crow (*Corvus brachyrhynchos*; year-round resident);
American goldfinch (*Carduelis tristis*; year-round resident);
American robin (*Turdus migratorius*; year-round resident);
Black-capped chickadee (year-round resident);
Common grackle (*Quiscalus quiscula*; year-round resident);
Golden-crowned kinglet (*Regulus satrapa*; winter resident; spring and fall migrant);
Dark-eyed junco (winter resident; spring and fall migrant);
Rufous-sided towhee (year-round resident);
Red-winged blackbird (year-round resident);
Yellow-rumped warbler (winter resident; spring and fall migrant).

The Service conducted avian surveys for the FIMP project from May-July of 1982, from Moriches Inlet to Montauk Point (U.S. Fish and Wildlife Service 1983). These surveys identified many of the above listed species as dominant in the terrestrial/mid-barrier island habitats, as well as the following additional species:

Brown thrasher (year-round resident);
Bobwhite (year-round resident);
Ring-necked pheasant (*Phasianus colchicus*; year-round resident);
Field sparrow (year-round resident);

Prairie warbler (summer resident);
Chipping sparrow (*Spizella passerine*; year-round resident);
Marsh wren (*Cistothrus palustris*; summer resident).

**Corps Small Mammal and Herpetile Surveys**

The Corps surveys in May through August of 2002 (U.S. Army Corps of Engineers 2004c) indicated that the white-footed mouse, meadow vole (*Microtus pennsylvanicus*), and masked shrew (*Sorex cinereus*) were the most dominant small mammals within terrestrial upland habitats, while the woodland vole (*M. pinetorum*), norway rat (*Rattus norvegicus*), white-tailed deer, red fox, eastern cottontail, and gray squirrels (*Sciurus carolinensis*) were also observed. Box turtles (*Terrapene carolina*) and Fowler's toad were the only herpetiles observed in this habitat. Although not observed during these surveys, other herpetile species expected to occur in terrestrial habitats include the eastern spadefoot toad and northern black racer (*Coluber constrictor constrictor*). The snapping turtle (*Chelydra serpentine*) was observed in freshwater wetlands within terrestrial habitats, spring peepers (*Hyla crucifer*), and bullfrog (*Rana catesbeiana*) are expected to occur in these habitats, as well. The spring peeper, Fowler's toad, eastern painted turtle, snapping turtle, green frog (*R. clamitans melanota*), and eastern garter snake were observed in terrestrial freshwater wetlands and ponds during Service surveys in 1982 (U.S. Fish and Wildlife Service 1983).

## D. Bay Ecosystem

### 1. Bay Intertidal

**Vegetation**

The dominant vegetation in the bay intertidal community includes saltmarsh cordgrass, saltmeadow grass, glasswort (*Salicornia* spp.), and groundselbush (*Baccharis halimifolia*). Wildlife found in this community includes the muskrat (*Ondatra zibethica*), great egret, northern harrier, and seaside sparrow. Fish found in the tidal pools and ditches within this community include the mummichog, silverside, and fish which use marshes as nurseries, including striped bass and winter flounder.

Saltmarshes are tidal marshes of brackish or saltwater, along estuaries and behind barrier beaches. Tidal marsh generally consists of dense stands of herbaceous wetland vegetation dominated by Spartina alterniflora and S. patens and subject to variation in water depth during each tidal cycle (McCormick and Associates 1975). Saltmarshes are among the most productive communities known. Most of the tremendous production of saltmarshes is used in the form of organic detritus (Odum 1961). This organic detritus, mostly Spartina wrack (New York Sea Grant Institute 1993), is then distributed throughout the system (Odum 1961). Coastal marshes are also important in stabilizing shorelines and as wildlife habitat (New York Sea Grant Institute 1993).

The NPS-FIIS vegetation mapping efforts (Conservation Management Institute 2002) designated several vegetation classes/communities present within bay intertidal areas, listed in Table 4.

Table 4. NPS-FIIS Bay Intertidal Vegetative Communities of Fire Island

| Vegetation Class/ Community | Description | Dominant Species |
|---|---|---|
| Reedgrass Marsh | Widespread, found in and around most wetland areas on both the Floyd Estate and Fire Island | Common reed, groundselbush, poison ivy |
| Low Saltmarsh | More regularly flooded parts of the saltmarsh | Saltmarsh cordgrass, spikegrass, glasswort (*Salicornia* spp.) |
| High Saltmarsh | Found in close proximity to *Spartina alterniflora* on the less-frequently flooded portions of the saltmarsh | Salt meadow grass, spikegrass, black grass (*Juncus geradii*), glasswort |
| Brackish Marsh | Found uncommonly near the highest portions of the saltmarsh on the bay side of Fire Island | Saltmeadow grass, switchgrass, Canadian rush, blackgrass |

It should be noted that bulkheads are common on the bay shoreline in developed communities and areas. Bulkheads prevent sand from entering the littoral drift system, causing sediment starvation in unprotected areas downdrift (Nordstrom *et al.* 2005). Bulkheaded areas are generally void of tidal marsh vegetation and are of minimal habitat quality. Also, nearly all the back-barrier fringe marshes on Fire Island have been grid ditched for mosquito control (National Park Service 2009).

Sand shoals and mud flats provide important forage habitat for wading birds such as the black-bellied and piping plover, greater yellow-legs, sanderling, American oystercatcher, and dunlin (U.S. Fish and Wildlife Service 1983). These areas also provide important loafing/resting/ stopover habitat for many shorebirds, such as the roseate tern, common tern, least tern, and black skimmer. Sand shoals and mudflats also provide breeding habitat for the horseshoe crab, discussed further below.

**NPS-FIIS Evaluation of Marsh Development**

The NPS-FIIS conducted a monitoring program to quantify marsh elevation change in relation to sea-level rise and to identify factors and/or processes that influence the development and maintenance of Fire Island saltmarshes. Monitoring was conducted in three marsh areas, Great Gun Meadows, Hospital Point, and Watch Hill from August 2002 to May 2007. The NPS determined that the development of the three marshes coincided with the establishment of the Hallets (1788) and Smiths (1773) inlets. Storm-induced inlets and barrier island overwash transport sediment from the ocean and barrier island to the bay. As such, inlets and associated flood tidal deltas support the establishment of back-barrier saltmarsh habitat (Roman et al.2007).

See Section V-B for a discussion of NPS-FIIS's findings regarding marsh elevation and sea-level rise.

## Wetland Trends

Having an understanding of the trends of wetland accretion/gains or losses in the bays will assist decision-makers and biologists in assessing the status of this important resource within the FIMP study area. This assessment will assist in determining and gauging/weighing the significance in impacts of the proposed action, should the proposed action alter the natural processes that form these habitats (cross-island sediment transport, bayside shoreline processes).

The NYSDEC conducted a trend analysis of New York State's tidal wetlands in Moriches and Shinnecock Bays using GIS analysis in 1996 which was updated in 2015. Within the FIMP study area since 1974, there has been: a net loss of 308 ac. of tidal wetlands from Fire Island Inlet to Moriches Inlet (Great South Bay); a net gain of 60.9 ac. in Moriches and Shinnecock Bays; and a net loss of 55.4 ac. in Mecox Bay, Sagaponack Pond, and Georgica Ponds. The gains in Moriches and Shinnecock Bays are likely a result of landward movement of the tidal wetlands boundary (Fallon and Mushacke 1996; Cameron Engineering & Associates, LLP 2015).

Despite a net gain of tidal wetlands in Shinnecock Bay, there were thirteen separate islands, but by 1995, six of the islands had completely disappeared and the remaining islands had a loss of wetland areas (Fallon and Mushacke 1996). Service personnel have observed the loss of Warner's South Island (Little Warner's) in Shinnecock Bay, which was historically an important colony site for the federally endangered roseate tern. The island supported the colony until 2001-2002, when the island was flooded over.

The primary causes of wetland loss are listed as follows (Cameron Engineering & Associates, LLP 2015):

- Conversion of high marsh to intertidal marsh;
- Formation of pannes and ponds within marshes;
- Conversion of interior marsh to mudflats;
- Alteration/widening of tidal creeks and man-made ditches;
- Erosion and retreat of seaward wetland edge;
- Phragmites australis encroachment;
- Sea-level rise
- Low sediment supply.

Erosion may be caused by: a) the apparent deficit of sediment in the bays due to maintenance dredging activities (Intracoastal Waterways) and boat wake reflection (Cameron Engineering & Associates, LLP 2015).

## Significant Habitats

Significant bay intertidal habitats within the FIMP are present in Great South Bay, Moriches Bay, Shinnecock Bay and coastal ponds including Mecox Bay, Sagaponack Lake, and Georgica Pond. A general description of each of these waterbodies (excerpted from the Service's SHCR) is provided below.

### Great South Bay

The Great South Bay complex as defined here includes 47 km (29 mi.) of this system from South Oyster Bay east to Moriches Bay. This part of the Long Island back barrier system is characterized by shallow open water habitat with extensive saltmarshes along the backside of the barrier beach and along tidal creeks and rivers feeding into the bay from the mainland. Great South Bay occupies an area of 243 km2 (151 square miles [mi2]) and has an estuarine drainage of 1,360 km2 (845 mi2), with a daily average freshwater inflow of 19.8 cubic meters (m3) per second (700 cubic ft [ft3] per second). The majority of this flow originates from six groundwater-fed bodies: Orowoc Creek, Champlin Creek, Connetquot River, Swan River, Beaverdam Creek, and Carmans River. Great South Bay is the only one of the Long Island south shore bays that has major riverine input (from the Carmans and Connetquot Rivers) (U.S. Fish and Wildlife Service 1996).

### Moriches Bay

The Moriches Bay habitat complex includes the entire 3,836-hectare (ha) (9,480-ac) aquatic environment of Moriches Bay, Moneybogue Bay, and Quantuck Bay; this includes open water, saltmarshes, dredged material islands, and intertidal flats, as well as the eastern end of the Fire Island barrier island, the western end of the Westhampton Beach barrier island (the barrier island between Moriches and Shinnecock Inlets), Moriches Inlet, and the nearshore waters of the New York Bight. The western boundary of this complex is the Smith Point Bridge; the eastern boundary is the eastern edge of Quantuck Bay. This habitat complex also includes the tidal creeks and marshes feeding into Moriches Bay from the Long Island mainland and the adjacent uplands of the William Floyd Estate. This boundary encloses regionally significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants (U.S. Fish and Wildlife Service 1996). Moriches Bay is a regionally-significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants. There are 105 species of special emphasis in the Moriches Bay complex, incorporating 42 species of fish and 41 species of birds (U.S. Fish and Wildlife Service 1996).

### Shinnecock Bay

The Shinnecock Bay habitat complex comprises the entire 3,642-ha (9,000-ac) aquatic environment of Shinnecock Bay, including open water, saltmarshes, dredged material islands, and intertidal flats, in addition to the eastern end of the Westhampton Beach barrier island (refers to island between Moriches Inlet and Shinnecock Inlet), the western end of the Southampton Beach barrier spit, Shinnecock Inlet, and the nearshore waters of the New York Bight. The western boundary of this complex is the Quogue Canal in Quogue; the eastern boundary is the eastern edge of Taylor Creek in Southampton Village. This habitat complex also includes the tidal creeks and marshes entering into Shinnecock Bay from the Long Island mainland. This boundary encloses regionally significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants (U.S. Fish and Wildlife Service 1996). Shinnecock Bay is a regionally significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants. There are 97 species of special emphasis in the Shinnecock Bay complex, incorporating 42 species of fish and 37 species of birds (U.S. Fish and Wildlife Service 1996).

Mecox Bay, Sagaponack Lake, and Georgica Pond (Part of South Fork Atlantic Beaches Complex)

The South Fork Atlantic beaches habitat complex boundary encloses the entire 27-km (17-mi.) stretch of sand beach, dunes, and associated bays from Halsey Neck Pond at the eastern end of Shinnecock Bay in Southampton east to the eastern edge of the Amagansett NWR in East Hampton. The habitat boundary encloses the entire beach strand habitat from the ocean inland to the mainland or back barrier ponds; this includes the foreshore, backshore, dunes, and interdunal areas as well as the nearshore waters extending offshore about 1/4 mile. The habitat complex also includes the aquatic habitats in Mecox Bay and other bays and ponds. This boundary encompasses nesting and feeding habitat for beach-nesting birds, rare beach and interdunal swale communities and plants, and wintering waterfowl habitat. The beaches on the South Fork front directly on the mainland or are only minimally separated from the mainland by small ponds and bays. Mecox Bay, Sagaponack Pond, and Georgica Pond are brackish ponds that are breached intermittently to alleviate flooding and improve water quality (U.S. Fish and Wildlife Service 1996).

In addition to the tidal marshes present throughout each of the identified bays, the Service's SHCR identifies specific bay intertidal areas within the following significant habitat complexes:

Moriches Bay

*William Floyd Estate* – One of the few remaining sites where tidal wetlands are contiguous to an undeveloped upland buffer.

Shinnecock Bay

*Dune Road Marsh (adjacent to Tiana Beach)* – Important waterfowl, wading bird, and songbird nesting habitat, and the marshes, shallows, and flats are important foraging areas for these birds, as well.

Great South Bay

*Connetquot River Estuary* – A unique 4,500-ac undeveloped coastal watershed that is an important wintering area for waterfowl.

*Champlin Creek* – A brackish coastal stream which provides rich spawning and nursery habitats for commercially valuable marine species.

*Orowoc Creek* – A freshwater coastal stream that harbors a locally rare population of naturally-reproducing brook trout.

*Swan River* – Supports both native brook trout and sea-run brown trout (Salmo trutta).

*Beaverdam Creek* – Supports sea-run brown trout.

*Carmans River Estuary* – Extensive and undeveloped tidal wetlands on both sides of the river provide outstanding habitat for a great diversity of fish and wildlife species, specifically being one of the most significant nursery areas for yearling striped bass in Great South Bay.

With the exception of the William Floyd Estate, each of the above designated significant habitat complexes are also designated as SCH's by the NYSDOS. Additional NYSDOS-designated SCH's within this zone are described in the following excerpts from the NYSDOS's website (http://www.nyswaterfronts.com/waterfront_natural_narratives.asp#LongIsland):

Far Pond and Middle Pond Inlets in Shinnecock Bay

Far Pond and Middle Pond Inlets are adjoining undeveloped barrier peninsulas and tidal inlets, which are a relatively uncommon ecosystem type in Suffolk County. Piping plovers and least terns nest on the peninsulas, and the inlets are important feeding areas for least terns and other shorebird species because of the concentrations of fish which occur in those locations. Both ponds serve as nursery areas for winter flounder.

Sagaponack Inlet that flows into the Atlantic Ocean

The Sagaponack Inlet fish and wildlife habitat consists of a relatively small, undeveloped, inlet through the ocean side barrier beach. This represents an ecosystem type that is generally rare in Suffolk County, being found at only a limited number of locations along the south shore and in the eastern forks of Long Island. Sagaponack Inlet serves as a nesting and foraging site for least terns and piping plovers.

Long Pond Greenbelt in Sagaponack Lake

The Long Pond Greenbelt is an interconnected pond/wetland ecosystem with undeveloped border areas. This ecosystem type is rare in Suffolk County and provides important habitat for a wide variety of fish and wildlife species. The Long Pond Greenbelt site is included in the "Southampton Green Belt" IBA (one of 127 such areas), which extends from Tuckahoe in the west to the Sag Harbor area in the east. Sagaponack Pond has been designated and mapped as an undeveloped beach unit pursuant to the Federal Coastal Barrier Resources Act, prohibiting federal financial assistance or flood insurance within the unit. The NYNHP, in conjunction with TNC, recognizes the greater Long Pond Greenbelt complex, including Long Pond Greenbelt, Slate Pond, Black Pond Bridgehampton, and Little Poxabogue Pond, as a Priority Site for Biodiversity. The larger Long Pond/Southampton Greenbelt is an undeveloped corridor across the South Fork between the Atlantic Ocean and the Peconic Bays, serving as an important migratory stopover for birds and insects.

**Finfish/Invertebrates**

2001-2002 Surveys

The Corps conducted a finfish/invertebrate survey of back-bay intertidal areas in 2001 and 2002. Beach seining was conducted along the shoreline and in tidal ponds, while throw traps were used in marsh areas. A total of 15 stations were sampled from June 2001 to May 2002, along the backbay side of the barrier island intertidal zone from Fire Island Inlet to Shinnecock Inlet. Seven stations were sampled along Great South Bay: Kismet, Clam Pond, Sailor's Haven, Barrett Beach, Watch Hill, Old Inlet, and Pattersquash. Five stations were sampled along Moriches Bay: Cupsogue, Dune Lane, Pikes Beach, Picket Point, and Jessup Lane. Three stations were sampled along Shinnecock Bay: Tiana Beach, Ponquogue West, and Ponquogue East. Sampling was conducted bimonthly (twice per month, typically every other week) during the course of the study. There was a four-month hiatus in sampling from December 2001 through March 2002 - a winter period when productivity was minimal (U.S. Army Corps of Engineers 2005b). Samples were collected along the shoreline and in tidal ponds.

The surveys found that the dominant finfish species in the intertidal shoreline areas were Atlantic silverside, striped killifish (*Fundulus majalis*), and bay anchovy. Total numbers of finfish collected at each station ranged from the lowest catch at Barrett Beach (372) to highest catch at Clam Pond (14,533). Finfish species diversity appears to fluctuate randomly throughout all stations and bays. Dominant invertebrate species included sand shrimp (*Crangon septemspinosa*), marsh grass shrimp (*Palaemonetes vulgaris*), and blue crab (*Callinectes sapidus*). Total abundances were highest in October (8,705) and lowest in July (1,123). Spatially, the number of species and diversity appears to fluctuate randomly (U.S. Army Corps of Engineers 2005b).

In tidal ponds, sheepshead minnow (*Cyprinodon variegates*) was the most abundant species, comprising 42 percent of the total catch. Striped killifish were also collected in large numbers, representing 26 percent of the total catch. Spatially, pond abundances were highest at Ponquogue East (519) and Cupsogue (420). Lowest abundances were at Picket Point (149) and Old Inlet (202). On a monthly basis, finfish abundances were highest in July (495) and lowest in April (6) and May (21). Marsh grass shrimp was the dominant invertebrate species collected representing 69 percent of the total catch. Monthly abundances were highest in May (27), April (25), and October (24). Months with the lowest catches occurred in September (3), July (4), and August (5) (U.S. Army Corps of Engineers 2005b).

Stony Brook University conducted trawl surveys in Great South Bay as part of their assessment of the impacts of the breach at Old Inlet on the bay ecosystem from 2013-2015 during spring, summer and fall months at randomly selected stations (Frisk *et al.* 2015). As in 2001-2002, the bay anchovy was found to be a dominant species found in these surveys for each of the three years sampled. Other dominant species in each of the three years included the blue crab, lady crab (*Ovalipes ocellatus*), spider crab and summer flounder. Species dominant in 2013 and 2015 include weakfish (*Cynoscion regalis*) and bluefish (*Pomatomus saltatrix*). Additional dominant species in 2013 included spot (*Leiostomus xanthurus*), Atlantic silverside, tautog and sand lance (*Ammodytes* sp.). Other dominant species in 2014 included the Northern puffer (*Sphoeroides maculatus*), squid, cunner, northern pipefish, and butterfish and other dominant species in 2015 included sea robin, winter flounder, mantis shrimp (*Stomatopoda* spp.) and menhaden.

To complement other FIMP studies, sediment was analyzed for sediment type as well for benthic organisms from six stations along West Hampton Island: Cupsogue, Dune, Picket Point, Jessup, Ponquogue West, and Ponquogue East. Samples were collected at seven tidal locations from each site (U.S. Army Corps of Engineers 2005b). This study found that all samples were composed primarily of sand, with several stations (dispersed throughout the study area) consisting of sand with gravel, and several with sand and silt (U.S. Army Corps of Engineers 2005b). Annelids, arthropods, and mollusks dominated the collections during both seasons (spring and fall). During Year 2, annelids, arthropods, and mollusks were still dominant, as were aschelminths (spring and summer). Aschelminths, during Year 2, were much more abundant at all stations than during Year 1. In addition, at Ponquogue East, summer collections showed that over half of the benthos sampled were platyhelminths (U.S. Army Corps of Engineers 2005b).

**Corps Avian Surveys**

Dominant species observed within Spartina-dominated saltmarsh/tidal wetland habitats during Corps surveys from May 2002-May 2003 (U.S. Army Corps of Engineers 2003) include:

Canada goose (year-round resident);
Least sandpiper (foraging during migration);
Mallard (year-round resident);
Greater yellowlegs (foraging during winter and migration);
Red-winged blackbird (year-round resident);
Seaside sparrow (year-round resident);
Sharp-tailed sparrow (year-round resident); and
Willet (foraging in summer).

Although not a numerically dominant species, an important predator within this habitat is the northern harrier, a fall migrant/year-round resident, which preys upon small mammals, birds, and reptiles.

Dominant species observed within Phragmites-dominated bay intertidal habitats during Corps surveys from May 2002-May 2003 (U.S. Army Corps of Engineers 2003) include:

Song sparrow (year-round resident);
Yellow warbler (summer resident; spring and fall migrant);
Yellow-rumped warbler (winter resident; spring and fall migrant);
Red-winged blackbird (year-round resident);
Dark-eyed junco (winter resident; spring and fall migrant); and
Common grackle (year-round resident).

Dominant species observed within bay intertidal flat habitats during Corps surveys from May 2002-May 2003 (U.S. Army Corps of Engineers 2003) include:

American oystercatcher (summer breeder; spring and fall migrant);
Black-bellied Plover (*Pluvialis squatarola*; forages in beach habitat during winter and migration);
Common tern (summer breeder; spring and fall migrant);
Dunlin (*Calidris alpine*; forages in beach habitat during winter and migration);
Greater yellowlegs (foraging during winter and migration);
Herring gull (year-round foraging);
Ruddy turnstone (*Arenaria interpres*; spring and fall migrant);
Sanderling (*Calidris alba*; forages during winter and migration); and
Willet (foraging in summer).

The NYSDEC and Cornell Cooperative Extension conducted migratory shorebird surveys of the Moriches Bay shoreline at 16 sampling stations (4 along the south shore of the Long Island mainland; 4 on Fire Island and 8 on the Westhampton Barrier Island) during the spring of 2012 and 2013 to capture the spring migration (Sclafani *et al.* 2014). Important foraging/loafing areas that had the highest shorebird densities included Pikes Beach in Westhampton (maximum of 3,009 birds observed on May 24, 2012) and Cupsogue County Park in Westhampton (maximum of 2,536 birds observed on May 31, 2012). Other important shorebird foraging/loafing areas include East Inlet Island near Moriches Inlet, the Great Gunn area of Smith Point County Park and the Moriches Bay shoreline of Terrell River County Nature Preserve. Dominant species observed included the red knot, dunlin, sanderling, semi-palmated sand spiper, and ruddy turnstone (Sclafani *et al.* 2014).

Virginia Polytechnic Institute also surveyed shorebird habitat use on Fire Island and Westhampton barrier islands in 2014 (Derose-Wilson *et al.* 2015). Important forage areas identified included the backbay sandbar at Cupsogue County Park (21,576 individual birds), the ocean beach at Smith Point County Park (10,110 birds) and the breach at Otis Pike Wilderness Area (3,463 birds). Dominant species included black-bellied plover, dunlin, ruddy turnstone, sanderling, short-billed dowitcher (*Limnodromus griseus*), semipalmated plover and semipalmated sandpiper (Derose-Wilson *et al.* 2015). Refer to Virginia Polytechnic Institute's 2015 report for more details on their findings.

**Federally-listed Species – Red Knot**

The red knot, a federally threatened species, does utilize low-energy bay intertidal areas (tidal flats and tidal marshes) within the FIMP study area as stopover/foraging habitat during spring and fall migrations (New Jersey Department of Environmental Protection 2007). While this species is known to be more concentrated in areas where horseshoe crab eggs are available for forage, research does document coquina clams (*Donax variabilis*) and blue mussels as being important prey species as well (Watts and Truitt 2015). Horseshoe crab eggs are also an essential food source for many other migrating shorebirds (NYSDEC website: http://www.dec.ny.gov/animals/36195.html).

Although the Service is not aware of comprehensive horseshoe crab and/or red knot surveys being conducted within the FIMP area, the NYSDEC and Cornell University Cooperative Extension are monitoring horseshoe crab spawning activity at select sites on Long Island, including two sites within the FIMP study area, Captree Island, and Pikes Beach Westhampton (Cornell University Cooperative Extension website: http://counties.cce.cornell.edu/suffolk/Vanderbilt/Horseshoe-research.htm). The Cornell Cooperative Extension of Suffolk County has indicated that Pikes Beach is a heavily utilized area for horseshoe crab spawning, including a peak of 6 crabs/meter in May of 2013 (Sclafani *et al.* 2014), and has identified the majority of the bay shoreline of Fire Island as potential spawning habitat (Sclafani, et.al 2009). One hundred and thirteen horseshoe crabs were observed spawning at Captree Island in 2007, where peak spawning generally occurs in the months of May and June and specifically occurred on June 3 (Sclafani *et al.* 2009). Horseshoe crab spawning was also confirmed at Captree Island, as well as Davis Park on Fire Island more recently during the years of 2011-2013 (Sclafani *et al.* 2014). Similar habitats along bay intertidal flats and/or marshes within the FIMP are expected to have horseshoe crab spawning activity and associated red knot foraging.

A more detailed assessment of the red knot will be completed during the ESA section 7 consultation.

**Corps Small Mammal and Herpetile Surveys**

The Corps surveys in May through August of 2002 (U.S. Army Corps of Engineers 2004c) indicated that the white-footed mouse, meadow vole, and masked shrew were the most dominant small mammals within bay intertidal habitats, while the white-tailed deer, raccoon (*Procyon lotor*), muskrat, and red fox were also observed. Although not observed during these surveys, the diamond-back terrapin is a common species found in bay intertidal habitats and was observed during Service surveys in 1982 (U.S. Fish and Wildlife Service 1983).

2. Back-Bay Subtidal

Seagrass beds represent a critical habitat for at least one species, the bay scallop (*Argopecten irradians*) (New York Sea Grant Institute 1993). The rock crab (*Cancer irroratus*) was found to be restricted to thick eelgrass areas (WAPORA 1982). The blue mussel and hard clam are species found in moderate to dense vegetation (O'Connor 1972). Seagrass beds provide hard clams with protection from whelks (*Buscyon* spp.), and possibly other predators as well (Peterson 1982). The venus clam (Gemma gemma) is an extremely abundant, suspension feeding bivalve found in especially high abundance in eelgrass regions (WAPORA 1982). It is an important forage species for shorebirds.

Seagrass beds are also noted for high densities of fish, in part because of the abundant food supply (Heck *et al.* 1989). The importance of eelgrass as a habitat for the juvenile and adult stages of numerous marine fishes has been frequently documented (New York Sea Grant Institute 1993). Many studies have shown that eelgrass beds support significantly higher faunal densities than other habitats (Orth *et al.* 1984). Eelgrass is the predominant submerged vascular plant, while widgeon grass (Ruppia maritima) is also an important seagrass species present within the FIMP bays, although distributed in small patches (Bokuniewicz *et al.* 1993). Abundances of sand shrimp were found to be approximately 70 percent greater in widgeon grass beds than in eelgrass beds (New York Sea Grant Extension Program 2001).

New York Sea Grant Institute (1993) reported that juvenile tautog and cunner (*Tautogolabrus adspersus*) depend strongly on eelgrass habitat as a shelter and/or nursery. Winter flounder also appear to use eelgrass beds as nursery areas (Heck *et al.* 1989). Again, forage fish species critical to the bay food web, particularly stickleback species (Apeltes quadracus and Gasterosteus aculeatus), also depend upon this habitat.

Eelgrass is an important foraging resource for avian species, especially brant. The distribution of major waterfowl feeding and nesting areas in the adjacent Great South Bay (New York Sea Grant Institute 1993) closely corresponds to the distribution of eelgrass meadows.

Open Water/Non-Vegetated Bay Bottom: The substrate in this community consists of sand and silts in the low energy areas. Benthic organisms found in this habitat include the hard clam and clam worm (*Platynereis dumerilii*). Finfish found in this community include the striped bass and summer flounder, while wading birds and shorebirds, such as the great blue heron and piping plover, respectively, forage in the shallow/exposed bay bottom. Additionally, harbor seals have been documented using the bay and exposed sand shoals (U.S. Army Corps of Engineers 1999).

In addition to the actual bays identified below, the Service's SHCR identifies specific bay subtidal areas within the following significant habitat complexes:

<u>Long Pond Greenbelt</u>

Sagaponack Pond – Identified as an undeveloped beach unit of the Coastal Barrier Resources System.

<u>South Fork Atlantic Beaches</u>

Mecox and Georgica Ponds – Support colonies of least terns and consistent use by piping plovers near the inlets; important for both breeding and foraging; further description of Mecox Bay provided below.

The following NYSDOS-designated SCH's are present within this zone (excerpts from NYSDOS website:
http://www.nyswaterfronts.com/waterfront_natural_narratives.asp#LongIsland):

Great South Bay (East)

Great South Bay-East comprises approximately one-half of the largest protected, shallow, coastal bay area in New York State. This broad expanse of open water is highly productive, and supports a tremendous diversity of fish and wildlife species. Many species of migratory birds which typically occur in coastal habitats are found nesting or feeding in the remaining natural areas along the north and south shores of Great South Bay-East. These include green-backed heron, black-crowned night heron, snowy egret, American bittern, Canada goose, mallard, black duck, gadwall, northern harrier, osprey, least tern, herring gull, willet, horned lark, fish crow, marsh wren, red-winged blackbird, sharp-tailed sparrow, and seaside sparrow. Great South Bay-East is also one of the most important waterfowl wintering areas (November - March) on Long Island, especially for diving ducks, which feed on eelgrass, invertebrates, and small fish. Mid-winter aerial surveys of waterfowl abundance for the 10-year period 1975-1984 indicate average concentrations of over 10,700 birds in the bay each year (25,409 in peak year), including approximately 6,600 scaup (21,155 in peak year), 1,000 red-breasted mergansers (2,470 in peak year), 750 black ducks (2,710 in peak year), 700 brant (2,121 in peak year), 600 common goldeneye (1,750 in peak year), and 430 Canada geese (750 in peak year), along with lesser numbers of oldsquaw, bufflehead, mallard, mute swan, and canvasback. Based on these surveys, it appears that Great South Bay-East supports the largest wintering waterfowl concentrations in New York State, and is probably one of the most important areas for diving ducks in the northeastern United States.

Concentrations of waterfowl also occur in the area during spring and fall migrations (March-April and October-November, respectively). In addition to having significant bird concentrations, Great South Bay-East is an extremely productive area for marine finfish, shellfish, and other wildlife. Great South Bay-East serves as a major spawning, nursery, and foraging area (April - November, generally) for winter flounder, kingfish, bluefish, blue crab, and forage fish species, such as Atlantic silverside, striped killifish, mummichog, northern pipefish, and sticklebacks. The entire Great South Bay-East area is inhabited by local concentrations of hard clams along with local concentrations of American oyster.

Moriches Bay

Moriches Bay is one of three major protected, shallow, coastal bay areas on the south shore of Long Island, which constitutes one of the largest estuarine ecosystems in New York State. This highly productive bay supports a variety of fish and wildlife species throughout the year. Many species of migratory birds nest among the saltmarshes and spoil islands in Moriches Bay, including roseate terns (historically), common terns, and black skimmers. Other species nesting in the area include black duck, mallard, gadwall, American oystercatcher, great black-backed gull, herring gull, willet, clapper rail, fish crow, sharp-tailed sparrow, and seaside sparrow. The saltmarshes are used extensively as feeding areas by birds nesting in the area, and by a variety of herons, egrets, and other shorebirds. Moriches Bay is one of the most important waterfowl wintering areas (November - March) on Long Island. Mid-winter aerial surveys of waterfowl abundance for the 10 year period 1975-1984 indicate average concentrations of over 5,000 birds in the bay each year (8,382 in peak year), including approximately 2,150 scaup (4,470 in peak year), 350 brant (580 in peak year), 1,100 black ducks (1,580 in peak year), 400 red-breasted mergansers (920 in peak year), 400 Canada geese (870 in peak year), and 225 mallards (430 in peak year), along with lesser numbers of common golden-eye, bufflehead, oldsquaw, American widgeon, and canvasback. Based on these surveys, Moriches Bay supports wintering waterfowl concentrations of State-wide significance.

Concentrations of waterfowl also occur in the area during spring and fall migrations (March-April and October-November, respectively). In addition to having significant waterfowl concentrations, Moriches Bay is a productive area for marine finfish, shellfish, and other wildlife. Moriches Bay serves as a nursery and feeding area (April-November, generally) for bluefish, winter flounder, summer flounder, tomcod, American eel, blue crab, and forage fish species, such as Atlantic silverside, striped killifish, pipefish, and sticklebacks. Moriches Inlet is an especially significant component of the bay, as a corridor for fish migrations, as a source for the exchange and circulation of bay waters, and as an area where feeding by many fish and wildlife species is concentrated. As a result of the abundant fisheries resources in the bay, especially winter flounder, fluke, and baitfish species, Moriches Bay receives heavy recreational and commercial fishing pressure, of regional significance. Moriches Bay is inhabited by hard clams, bay scallops, and blue mussels, and most of the bay waters are certified for commercial shellfishing.

Shinnecock Bay

Shinnecock Bay is part of one of the largest estuarine ecosystems in New York State. This highly productive bay is important to a variety of fish and wildlife species throughout the year. Shinnecock Bay is one of the most important waterfowl wintering areas (November-March) on Long Island. Mid-winter aerial surveys of waterfowl abundance for the 10-year period 1975-1984 indicate average concentrations of over 3,500 birds in the bay each year (7,284 in peak year), including approximately 1,650 scaup (4,100 in peak year), 470 brant (1,060 in peak year), 380 black ducks (867 in peak year), 400 red-breasted mergansers (1,455 in peak year), 300 buffleheads (1,265 in peak year), and 100 common goldeneye (305 in peak year), along with lesser numbers of mallard, Canada goose, oldsquaw, and canvasback. Based on these surveys, Shinnecock Bay supports wintering waterfowl concentrations of statewide significance.

Concentrations of waterfowl also occur in Shinnecock Bay during spring and fall migrations (March-April and October-November, respectively). In addition to having significant waterfowl concentrations, Shinnecock Bay is a productive area for marine finfish, shellfish, and other wildlife. Much of this productivity is directly attributable to the saltmarshes and tidal flats which border the bay. Shinnecock Bay serves as a nursery and feeding area (April-November, generally) for bluefish, winter flounder, summer flounder, scup, weakfish, tomcod, blue crab, and forage fish species, such as Atlantic silverside, menhaden, striped killifish, pipefish, and sticklebacks. A total of 51 fish species were collected during an intensive survey of the bay in 1981. Shinnecock Inlet is an especially significant component of Shinnecock Bay, as a corridor for fish migrations, as a source for the exchange and circulation of bay waters, and as an area where foraging by many fish and wildlife species is concentrated. Wildlife species which feed extensively on fisheries resources near the inlet include the New York State-listed least tern (endangered) and common tern (threatened), and harbor seal. From December through early May, concentrations of harbor seals (approximately 30-40 individuals) occur in Shinnecock Bay.

Exposed sand shoals near the inlet provide an important "haulout" area, which seals use for resting and sunning. This location is one of about five major haulouts around Long Island, serving as a focal point for seals feeding in the bay. The bay is also inhabited by hard clams, soft clams, bay scallops, and bank mussels.

Mecox Bay

Mecox Bay and Beach is the largest of the coastal pond and wetland ecosystems east of Shinnecock Bay on the south shore of Long Island. The inlet which connects Mecox Bay to the ocean, through the barrier beach, is a relatively uncommon element of the coastal zone in eastern Long Island. This entire area is important to a variety of fish and wildlife species throughout the year. Mecox Beach serves as an important nesting site for least terns and piping plovers. Mecox Bay is especially significant as a waterfowl wintering area (November-March), with concentrations of Canada goose of statewide significance. Mid-winter aerial surveys of waterfowl abundance for the ten year period 1975-1984 indicate average concentrations of over 1,500 birds in the bay each year (3,079 in peak year), including approximately 1,200 Canada geese (2,978 in peak year), 100 black ducks (825 in peak year), and 100 scaup (600 in peak year), along with lesser numbers of mallard, common goldeneye, American widgeon, canvasback, and mute swan. Concentrations of waterfowl also occur in the area during spring and fall migrations (March-April and October- November, respectively).

In addition to being an important habitat for migratory birds, Mecox Bay is a productive area for marine finfish and shellfish. The creeks and wetlands which drain into the bay contribute to the biological productivity of this area. The bay contains populations of many estuarine species, including soft clam, American oyster, blue crab, and white perch.

**Corps Surveys**

SAV Surveys

The Corps funded ecological inventory surveys of six SAV beds, two in each of the three bays within the FIMP study area. The East Fire Island and Bellport beds are located in the Great South Bay, Great Gunn, and Cupsogue beds are in Moriches Bay, and Tiana and Ponquogue East beds are in Shinnecock Bay. Surveys were conducted from June through October of 2003, in 2004 (time of year not provided), and from May through November of 2005 (U.S. Army Corps of Engineers 2006b). Major components of the field survey included the collection of finfish and invertebrates in the eelgrass beds using a seine net, eelgrass quadrate analysis (eelgrass height and density), collection of water quality data, and sediment grain size.

Finfish

2004 Survey

Atlantic silverside was the most commonly distributed species found at all 6 SAV sites. Blackfish (Tautoga onitis), winter flounder, and cunner were the most abundant finfish, representing 23.8 percent, 16.7 percent, and 15.1 percent, respectively, of the total catch (U.S. Army Corps of Engineers 2004d, 2006b).

Easternmost sites were most productive, with Tiana and Ponquogue East stations having the highest abundances and biodiversity. The lowest levels of abundance and diversity were recorded at Bellport in Great South Bay.

2005 Survey

The Atlantic silverside was the most common species, representing 26.0 percent of the total catch. The next most commonly occurring species include bay anchovy and Atlantic tomcod (*Microgadus tomcod*), representing 16.5 percent and 13.9 percent of the total catch, respectively.

From a temporal perspective, the greatest diversity occurred during the months of July through September and the lowest in November (U.S. Army Corps of Engineers 2006b). A breakdown of dominant species and percent of total catch by month is listed as follows:

May: Atlantic tomcod (46.8 percent), fourspine stickleback (*Apelte quadracus*), and pollock (*Pollachius virens*), 46.8 percent, 13.5 percent, and 12.3 percent, respectively;

June: Atlantic silverside, Atlantic tomcod, and pollock, 46.0 percent, 16.9 percent, and 9.7 percent, respectively;

July: Bay anchovy, fourspine stickleback, and Atlantic tomcod, 59.6 percent, 7.7 percent, and 7.2 percent, respectively;

August: Atlantic silverside and northern sennet (*Sphyraena borealis*), 61.0 percent, and 8.8 percent, each respectively;

September: Cunner, Atlantic silverside, and blackfish, 41.0 percent, 35.0 percent, and 5.9 percent, respectively;

November: Northern pipefish (*Sygnathus fuscus*) and Atlantic silverside, 43.5 percent and 39.1 percent, respectively.

From a spatial perspective, the lowest catch was at Bellport in Great South Bay while the highest catch was at Cupsogue in Moriches Bay. Diversity was greatest at Ponquogue East (easternmost site), where 27 species were observed, while the lowest diversity occurred at East Fire Island (westernmost site), where 12 species were observed (U.S. Army Corps of Engineers 2006b).

Invertebrates

2004 Survey

Marsh grass shrimp was the most abundant and common species, representing 38.8 percent of the total catch and was found at all six locations. Comb jelly (*Mnemiopsis leidyi*) and green crabs (*Carcinus maenas*) were the second and third most commonly occurring invertebrate species, accounting for 25.1 percent and 11.0 percent of the total catch, respectively.

In regards to a spatial perspective, there were no discernible geographical trends, with the Cupsogue station in Moriches Bay having the greatest abundance and diversity of invertebrates and Ponquogue East in Shinnecock Bay had the lowest abundance and diversity (U.S. Army Corps of Engineers 2006b). There was a relative consistency of abundance and diversity between five of the six stations (the exception being Ponquogue East), indicating a uniformed distribution of invertebrates and habitat.

2005 Survey

The blue mussel was the most dominant species, although it was associated with a post-larval settlement on algae at the time of the sampling. Besides the blue mussel, the green crab consisted of 44.2 percent of the total counted catch, mud crab (*Panopeus herbstii*) with 15.0 percent, spider crab (*Libinia emarginata*) with 7.2 percent, and blue crab with 6.7 percent of the total counted catch (U.S. Army Corps of Engineers 2006b).

From a temporal perspective, invertebrate biodiversity was the lowest in May and the highest in June. The greatest invertebrate abundance was documented during the June sampling event, with August being the least productive. However, no obvious temporal trends could be established.

From a spatial perspective, the lowest diversity occurred at the Cupsogue station and the highest diversity at the East Fire Island station. The greatest abundance occurred at Ponquogue East Station while the least productive station was Cupsogue.

This study did determine a significantly negative correlation between finfish abundance and invertebrate biodiversity.

Landings Data

Landings of soft shell clams, oysters (*Crassostrea virginicus*), mussels, and conch (*Busycotypus canaliculatum*) in the Great South Bay were modest in the 1990's (most recent available data). Soft shell clam landings peaked in 1967 (over 3,000 bushels) and in 1985 (over 2, 500 bushels), and less than 100 bushels in 1999. Oyster landings peaked in 1961 (over 8,000 bushels) and have not gone above 100 bushels since 1981. Mussel landings peaked in 1965 (over 7,000 bushels) and less than 200 bushels since 1995. Conch landings peaked in 1985 (over 2,000 bushels) and have been less than 200 bushels since 1992. Blue crab landings increased in the early 1990's, peaking at over 450 pounds in 1990 (New York Sea Grant Extension Program 2001).

Shellfish

Shellfish present within the subtidal habitat of the backbays include the hard clam, blue mussel, soft shell clam (*Mya arenaria*), oyster, and bay scallop (*Aequipecten irradians concentricus*). Hard clams and other shellfish such as bay scallop and soft clam play a critical role in the bays, filtering water and serving as an important link in the food web. During the 1970s, there were enough hard clams to filter 40 percent of Great South Bay every day. Today, only 1 percent of the Great South Bay is filtered daily (The Nature Conservancy website: http://www.nature.org/wherewework/northamerica/states/newyork/press/press1616.html). Since 1976, the hard clam harvest has declined 100 fold (Hinga 2005). The shellfish stocks have been declining steadily since the 1960s. The causes of the decline are still not proven, but poor natural recruitment, over-harvesting, increased predation, long-term climatic changes in temperature and salinity, and toxic algal blooms, such as brown tide, have been identified as possible factors (Town of Southampton 2001).

High abundances of hard clams are found in sediments with a larger fraction of course-grained materials, especially shell fragments, which appear to provide a more diverse habitat community of suspension feeders and carnivores (Hinga 2005). The South Shore Estuary Council (2001) recommended in their Comprehensive Management Plan that hard clam populations in Great South Bay, Moriches Bay, and Shinnecock Bay be enhanced through shell augmentation projects, using shell materials from appropriate sources (South Shore Estuary Reserve Council 2001).

Optimal temperature and salinity for adult hard clam growth has been estimated to be 20-30° C and 26-27 ppt (New York Seagrant Extension Program 2001).

Since 2004, TNC has been involved in restocking its 13,000-ac underwater holdings in the Great South Bay with adult hard clams (over 2.2 million as of 2013) in the hopes that they will reproduce, and ultimately restore, the bay (The Nature Conservancy 2013). The TNC has also planted over 10,000 bay scallops. Shellfish pump large volumes of water to feed on plankton and other organic particles. This, in turn, influences the entire food web and enhances ecosystem stability (The Nature Conservancy website: http://www.nature.org/wherewework/northamerica/states/newyork/press/press1616.html). The Service recommended shellfish bed restoration in its Planning Aid Report in 2005 for the FIMP, which identified potential restoration projects within the FIMP Study Area (U.S. Fish and Wildlife Service 2005).

Several municipalities also have clam restocking programs. The Town of Islip operates a shellfish culture facility to provide a sustainable source of seed clams to assist the recovery of stocks and to rebuild the public resource in the bay (Great South Bay). The facility is designed to produce up to forty million seed clams for planting annually (Town of Islip website: http://www.isliptown.org/details.cfm?did=110).

The Town of Babylon operates a spawning sanctuary – an area stocked with clams at high densities with the hope of enhancing reproduction. To date, over 6, 200 bushels of clams have been stocked. The Town of Babylon also operates a seed clam growout program in which one million 3-5 mm seed clams grow-out in rafts. Approximately 20 mm clams are broadcast into the bay. Over 25,000,000 clams have been introduced since the program's inception (Town of Babylon website: http://www.townofbabylon.com/departments/details.cfm?did=9).

The Town of Brookhaven's Division of Environmental Protection actively manages a Shellfish program, involving placement of approximately 100,000 spawner clams into Great South Bay annually and 1,000,000 12 mm seed clams in 2005. The Town of Brookhaven is planning to open a grow-out facility whose clams will be planted on the south shore in Great South Bay.

The Town of Southampton Trustees currently are undertaking trials of oyster seed introduction within Mecox Bay in an effort to increase the current population. The predominant shellfish taken from Mecox Bay include oysters and soft-shell clams (Town of Southampton 2001). The Southampton Trustees, in conjunction with the Cornell Cooperative Extension, undertake a seeding program yearly. Two million clams, approximately 12 mm in size, are planted on the bay bottoms, and 500,000 at 5 mm in size are placed in the Trustees owned rafts. Cornell Cooperative also rears oysters and scallops as space permits. The Southampton Trustees also transplant shellfish from uncertified areas (areas where shellfish harvest is not allowed) into seasonal areas in an effort to not only increase the current stock, but also to aid in optimal spawning (Town of Southampton 2001).

The Town of Easthampton program involves the restocking of hard clams, oysters, and bay scallops. In 2006, more than 2 million oysters were grown to planting size and seeded into East Hampton Town waters. A total of over 12 million hard clams were seeded throughout the 2006 growing season while approximately 200,000 scallops, were either over-wintered in Napeague Harbor or seeded into town harbors (Town of Easthampton website: http://www.town.east-hampton.ny.us/aquaculture.cfm)

Scientists hope that rebuilding the populations of these filter feeders will help control development of nuisance algae blooms like brown tide. Brown tide blooms periodically in each of the bays. This species appears to mechanically interfere with shellfish ingestion of other types of phytoplankton, essentially starving these herbivores. Hard clams can experience significant mortalities (67 percent) during brown tide blooms, and these blooms also prevent light penetration to the bottom, thereby affecting SAV as well (Hinga 2005). The primary cause of these blooms appears to be related to the relatively high levels of dissolved organic matter and dissolved organic carbon (Hinga 2005).

Eelgrass Height and Density

Eelgrass provides critical habitat for finfish, invertebrates, and waterfowl. The health of an eelgrass bed is better measured by density rather than height, because plant stability is gained through the expansion of rhizomes (U.S. Army Corps of Engineers 2006b).

2004 Survey

Eelgrass density (mean percent coverage within 1 m [3.3 ft] squared quadrants) ranged from 25 to 80 percent, with the least dense bed occurring at the Cupsogue station in Moriches Bay in August, and the densest at East Fire Island in Great South Bay and Tiana in Shinnecock Bay during July and August, respectively (U.S. Army Corps of Engineers 2006b). Average density was highest for Shinnecock Bay and lowest for Moriches Bay.

2005 Survey

Eelgrass bed density was greatest at East Fire Island in Great South Bay in June and least at Cupsogue in Moriches Bay in June, as well. Average density was highest in Shinnecock Bay and lowest in Moriches Bay.

From a temporal perspective, the month when each station had its maximum eelgrass bed density is listed as follows:

| | | |
|---|---|---|
| Great South Bay | East Fire Island | June (95 percent) |
| | Bellport | September (90 percent) |
| Moriches Bay | Great Gunn | August (80 percent) |
| | Cupsogue | September (60 percent) |
| Shinnecock Bay | Tiana | November (90 percent) |
| | Ponquogue East | August and September (65 percent) |

An analysis of the relationship between eelgrass bed height and density and abundance and diversity of finfish and invertebrates indicated that there was no correlation. This conclusion suggests that faunal abundance and density are not dependent on eelgrass height or density.

The Corps' general conclusions of the study are listed as follows:

Eelgrass density and height were greatest when temperatures were highest;
Eelgrass density and height were greatest in Shinnecock and Moriches Bays;
Finfish abundance and diversity increased from west to east (greater in the eastern portions of the study area), and diversity increased with temperature.

Some efforts are being undertaken to restore eelgrass/submerged aquatic vegetation beds in the bays present within the FIMP. For example, the Shinnecock Bay Restoration Program, working with Stony Brook University as part of an on-going effort to restore eelgrass beds in Shinnecock Bay, planted 8,200 reproductive shoots of eelgrass in the Bay in June of 2014 (http://sb.cc.stonybrook.edu/news/general/140618seedsofhope.php). This partnership is also planning to install clam sanctuaries in the Bay as well.

**Grain Size**

Samples primarily consisted of medium (size class of 0.25 mm to 0.50 mm) sand. Tiana in Shinnecock Bay had the highest percentage (65.45 percent) of medium sand while site with the lowest percentage of medium sand was found at East Fire Island in Great South Bay (which had the highest percentage of fine sand). However, the Corps determined that grain size between stations did not vary significantly and were statistically indistinguishable from each other, and that no significant correlations between grain size and effects of eelgrass density could be made. The Corps noted that sediment sampling of back-bay stations only entailed a grain size analysis. An analysis of organic material content was not conducted as part of the Corps' sampling effort (U.S. Army Corps of Engineers 2006b).

Hurricane Sandy Effect on Shellfish, Benthic Organisms, and Eelgrass Beds

Hurricane Sandy, while likely having long-term beneficial effects further described below, did bury sessile benthic organisms and submerged aquatic vegetation in Great South Bay in concentrated areas where overwash reached the bay side of the barrier island, in the vicinity of existing inlets where sediment was transported and where the breaches occurred. The largest areas of eelgrass and benthic organism burial occurred in the vicinity of Fire Island Inlet and the breach area at Old Inlet (Flagg 2013; Peterson pers. comm. 2014).

Pre-Hurricane Sandy Water Quality (FIMP Area - Corps Surveys)

Water quality parameters measured during the 2005 survey at each station included temperature, salinity, DO, and turbidity. Temperature values ranged from 9.79° C at Cupsogue in Moriches Bay to 26.15° C at Bellport in Great South Bay. However, study participants found no significant differences in temperature existed either spatially or temporally, and no general geographic patterns of increase or decrease were evident. The highest average DO concentrations were observed at the Ponquogue East station (10.66 milligrams [mg]/liter [L]). All station values, except for Tiana in September, were above 4.8 mg/L (USEPA minimum criteria for chronic and acute effects on biota). However, study participants indicated that that this reading may have been due to temporary equipment malfunction. Study participants found no differences in DO concentrations either spatially or temporally, and no general geographic patterns (U.S. Army Corps of Engineers 2006b).

Salinity ranged from 17.30 ppt at East Inlet Island in Great South Bay in June to 29.80 ppt at Ponquogue East in Shinnecock Bay in September. Salinity generally decreased by bay from east to west; however, study participants determined that it was unlikely that these decreases would have a negative impact on local biota (U.S. Army Corps of Engineers 2006b).

Turbidity values ranged from 0.00 Nephelometric Turbidity Units (NTU) at both Ponquogue East and Bellport stations during the August sampling event to 10.80 NTU at the Bellport station in Great South Bay in November. According to Singleton (2001), the management guideline for supporting marine life is < 8 NTU. Although two turbidity values were greater than the maximum standard, average values did not exceed this guideline and study participants state that these two values may have been due to equipment malfunction. Participants found no significant differences in turbidity either spatially, temporally, or from a geographic pattern perspective (U.S. Army Corps of Engineers 2006b).

When determining if environmental factors contributed to faunal and floral abundances and diversity, study participants found a positive correlation between temperature and finfish biodiversity (U.S. Army Corps of Engineers 2006b).

**Water Quality (Great South Bay – NPS-FIIS)**

A review of water quality data in Great South Bay, an effort sponsored by the NPS-FIIS, indicates that the salinity of the bay ranges from 25 to 30 ppt, surface water temperatures range from 25 to 29° C in the summer, and usually 0 to 2° C in the winter (Hinga 2005). Fecal coliform concentrations, although approaching levels of concern in some bayside beaches and marinas (see further below in South Shore Estuary discussion), are acceptable while there is an encouraging trend of decreasing dissolved inorganic nitrogen over the past quarter century, perhaps due to implementation of sewage management practices where sewage is discharged in the Atlantic Ocean instead of from individual septic systems (Hinga 2005). Sediment contamination levels are far below the levels that one would expect to have a major impact on the majority of organisms in the system (Hinga 2005). The DO concentrations in Great South Bay did not approach hypoxic (reduction of oxygen supply below physiological levels) or anoxic (without oxygen) concentrations that would be of concern to organisms, and oscillated between 6 mg/L and 12 mg/L with peaks in the winter and lower DO in the summer (Hinga 2005).

Post-Hurricane Sandy Water Quality Conditions

The Great South Bay Project sponsored by Stony Brook University and the NYSDOS, has been collecting water quality data in Great South Bay prior to and after Hurricane Sandy (refer to http://po.msrc.sunysb.edu/GSB/). Results from this monitoring indicates that the Fire Island breaches caused an initial increase in sea-level in Bellport Bay, but over the next 4 days after the breaches (October 30, 2012), the sea-level gradually returned to its normal level, as did the tidal range and phase (Flagg 2014). Water Quality data collected in 2013 from the Great South Bay Project buoy in Great South Bay, located in the middle of Great South Bay south of Sayville, lists the salinity range from 30.851 practical salinity units (psu) in November to 23.904 psu in February; a temperature range of -1.50° C in January to 29.40° C in July. Temperature and salinity measurements are similar to those reported by Hinga in 2005 (Hinga 2005). However, Flagg and Gobler (Flagg 2014; Gobler 2014) report that while the overall salinity for much of Great South Bay is similar to pre-Hurricane Sandy conditions, there is a net increase (3 to 6 units higher) in salinity in the eastern half of Great South Bay.

The net effect of the existing breach at Old Inlet on the water quality of eastern Great South/ Bellport and western Moriches Bays is an increase in bay salinity and an associated increase in water quality, and no significant change in the tidal dynamics and no increased risk from storm surges (Flagg 2014). Nitrogen can have potential negative side effects since they are quickly utilized by phytoplankton, leading to elevated chlorophyll levels (National Park Service 2009). Nitrogen concentrations in eastern Great South Bay are significantly lower than before the Old Inlet Breach (Gobler 2014). Water clarity has also improved, where secchi disc depths observed in 2013 (an indicator of water clarity) increased 35 percent in eastern Great South Bay (Gobler 2014). Increased ocean flushing and lowered nitrogen levels caused by the breach seem to have also lead to a decrease in phytoplankton levels in eastern Great South Bay. Although a large

(1,000,000 cells per mL) brown tide occurred across most of Great South Bay during the summer and fall of 2013, the ocean inlets and the breach at Old Inlet were spared of this tide (Gobler 2014).

**Backbay Benthic Invertebrate Survey**

The Corps contracted EEA, Inc., to conduct a benthic invertebrate survey at three locations: Sailor's Haven in Great South Bay, Pike's Beach in Moriches Bay, and Tiana Beach in Shinnecock Bay in August of 2000 (EEA, Inc. 2003). The purpose of the survey was to define the benthic invertebrate communities behind the Pike's Inlet Breach (breached in 1992) area and compare these findings to two areas (control sites) where breaches had not recently, or ever, occurred. The percent of abundance of dominant species at each location are listed as follows:

Sailors Haven – 47 percent polychaete worms (*Prionospio* spp.), 12 percent sipunculan worms (Oligochaeta spp.), 12 percent nematodes (*Nematoda* spp.), 12 percent tanaids (*Leptochelia savignyi*), and 10 percent amphipods (*Ampelisca abdita*). Biomass was dominated by annelid worms, arthropods, and mollusks (EEA, Inc. 2003);

Pikes Beach – 65 percent bivalves (*Gemma gemma*), 25 percent amphipods (*Paraphoxus epistomus*), 6 percent polychaete worms (*Capitellidae* spp.), and 5 percent tanaids. Biomass was evenly distributed between annelids, mollusks, and arthropods (EEA, Inc. 2003).

Tiana Beach – 67 percent polychaete worms (*Streblospio benedicti*, *Capitellidae* spp.), 11 percent nematodes, and 10 percent bivalve mollusks. Biomass was dominated by annelid worms, arthropods, and mollusks (EEA, Inc. 2003).

There was a greater abundance of benthic species at Pikes Beach, but a greater diversity of species at Sailors Haven. The data at Pikes Beach (higher abundances and lower diversity) is indicative of an area that is in recovery from a "disturbance" (albeit a natural "disturbance"). Surveyors also noted that SAV beds at the Pikes Beach station were more patchy and sparse than at the control sites (EEA, Inc. 2003).

**Anadromous Fish**

Numerous small creeks and rivers drain into the three bays and coastal ponds. Historically, these tributaries have supported fish migration from the sea to freshwater. Many of the significant habitats designated in the Service's SHCR were given this designation due to the presence of anadromous fish (fish that spend most of their lives in saltwater but migrate to freshwater to spawn), including the alewife, white perch (*Morone americana*), American smelt (*Osmerus mordax*), and diadromous (migrate between fresh and saltwater) fish, including sea-run brown trout. Dams constructed in these tributaries have blocked access and extirpated many of these migrations/runs.

The South Shore Estuary Reserve (SSER) and the Oceans Program of Environmental Defense have formed and chaired a diadromous fish conservation workgroup to address conservation within the Reserve Area (including the FIMP area) and evaluate the present status, threats, and potential actions (including fish passageways) to conserve and improve these fish populations. The workgroup has had several meetings (since December of 2004) and is currently identifying potential actions, survey needs, and funding sources.

Further information on the SSER can be found at their web site at:
http://www.estuary.cog.ny.us/.
The Service's Southern New England/New York Bight Office, in partnership with the NYSDEC's Fisheries Division, has proposed fish passageways for Mud Creek and Swan River (Halavik, pers. comm. 2004). These fishways would allow access for anadromous fish, primarily alewife.

**Corps Avian Surveys**

Dominant species observed within bay subtidal/open water habitats during Corps surveys from May 2002-May 2003 include:

Red-breasted merganser (winter resident);
Mallard (year-round resident);
Greater black-backed gull (year-round resident);
Herring gull (year-round foraging);
Gadwall (*Anas strepera*; year-round resident);
American black duck (year-round resident);
Bufflehead (*Bucephala albeola*; winter resident);
Common loon (*Gavia immer*; winter resident); and
Common merganser (winter visitor).

The Corps found this habitat to have the highest species richness and abundance during their avian surveys in 2002 and 2003 (U.S. Army Corps of Engineers 2003).

**South Shore Estuary Reserve (SSER)**

The SSER Council, a multi-agency/stakeholder organization, was established to protect and manage the South Shore Estuary Reserve system as a single integrated estuary (from Nassau County line to the Town of Southampton, including the Great South, Moriches, and Shinnecock Bays). The council identified numerous goals/outcomes to halt further degradation of the Reserve's natural resources and to improve them. Some of these goals, deemed to be applicable to the FIMP study, are listed as follows (South Shore Estuary Reserve 2001):

<u>Reduction of Nonpoint Pollution</u> – Elevated levels of coliform bacteria are responsible for the year-round closure of 12, 886 ac. of shellfish beds in Great South Bay and 6,170 ac. of shellfish beds in Moriches and Shinnecock Bays. Due to impervious surfaces within the watersheds, polluted stormwater runoff is the primary issue, as well as waterfowl and vessel discharges.

<u>Reduction of Point Source Pollution</u> – Although point source pollution is not as widespread as and less significant than non-point pollution, it can still cause water quality degradation in immediate areas. Such sources include wastewater treatment plants and other discharges

regulated by the State Pollution Discharge Elimination System permits, and solid waste disposal sites.

Increase in the Harvest Levels of Hard Clams and Other Estuarine Shellfish Species:

- Seeding of hard clams;
- Expansion of Islip Hatchery;
- Increase in grow-out (size of) shellfish;
- Enhancement of hard clam habitat through shell augmentation;
- Evaluation of spawner sanctuaries; and
- Creation of a reserve shellfish management forum.

Coastal Habitats Protected and Restored to Support Shellfish, Finfish, and Coastal Bird Populations:

- Restoration of tidal wetlands;
- Coordination of restoration efforts;
- Restoration of anadromous fish;
- Habitat restoration of tributaries;
- Evaluation and restoration of eelgrass beds;
- Vegetation management for coastal birds;
- Recognition of shorebird reserves;
- Increased protection of marine turtle populations;
- Management of upland ponds; and
- Augmentation of stream flow.

3. Bay Islands

The bay islands have many of the above described communities present, typically including low marsh, high marsh, and terrestrial uplands. Although many of the islands are man-made from dredge material placement, they provide important breeding habitat for shorebirds (tern colonies) and wading birds (heron rookeries).

As stated in Section VI subsection D, there has been a net loss of the number and size of bay islands (both manmade and natural) within the FIMP area due to storm events, rising sea levels, and erosion.

**Significant Habitats**

Service-designated significant bay island habitats include:

Moriches Bay

*Carter's, New Made, and West Inlet Islands* – New York State-listed common terns historically nested in large numbers.

*East Inlet Island* – Federally-listed roseate tern and state-listed common terns nested on the island until 1998.

Shinnecock Bay

*Lanes Island and Warner's Island* – Historically supported roseate and common tern colonies.

*Sedge Island, Greater Greenbacks Island, and Lesser Greenbacks Island* – Historically supported common tern colonies.

**Service Bay Island Investigations**

The Service's Long Island Field Office (LIFO) has conducted numerous site investigations of bay islands to identify restoration sites in Great South, Moriches, and Shinnecock Bays. Appendix A lists each of the backbay islands visited, the type of vegetation observed, history of wading bird and shorebird nesting (as of 2003), and restoration potential (U.S. Fish and Wildlife Service 2005).

4. Inlets

In addition to the actual bays identified below, the Service's SHCR identifies specific bay subtidal areas within the following significant habitat complexes:

Moriches Bay

*Moriches Inlet* – Provides a corridor for fish migration into the bay and a foraging area for harbor seals in the winter.

Shinnecock Bay

*Shinnecock Inlet* – Important haul-out area for harbor seals in the winter, as well as a corridor for juvenile loggerhead and green sea turtles that feed in the bay.

Great South Bay

*Fire Island Inlet* – Important in daily flushing of Great South Bay, corridor and habitat for finfish, and foraging habitat for the federally-listed roseate tern. Piping plover and least terns nest at Democrat Point on the east side of the inlet and Cedar Beach on the west side of the inlet.

## VII. DESCRIPTION OF SELECTED PLAN AND EVALUATED ALTERNATIVE

### A. General Description of the Proposed Project

The specific features, as described in the Corps' GRR (U.S. Army Corps of Engineers 2016b), of the TSP are listed below:

**Inlet Modifications**

- Continuation of authorized navigation projects, and scheduled O&M dredging with beneficial reuse of sediment at Fire Island, Moriches and Shinnecock Inlets;
- Additional dredging of 73,000 to 379,000 cy from the ebb shoals of each inlet, outside of navigation channel, with downdrift placement undertaken in conjunction with scheduled Corps Operations and Maintenance (O&M) dredging of the inlets;
- Placement of the bypassed material consisting of a +13 ft. dune and berm, as needed in identified placement areas; and
- Monitoring to facilitate adaptive management changes in the future.

**Mainland and Non-Structural**

- Addresses approximately 4,400 structures within 10 year floodplain using non-structural measures, primarily through building retrofits, with limited relocations and buy-outs, based upon structure type and condition; and
- Includes road raising in four locations, totaling 5.91 mi. in length, that reduce flooding to 1,020 houses.

**Barrier Islands**

- Breach Response

  - *Proactive Breach Response* – is a plan where action is triggered when the breach and dune are lowered below a 25-year design level of risk reduction, and provides for restoration to the design condition (+13 ft. dune and 90 ft. berm). This plan is included on Fire Island in vicinity of Lighthouse, Smith Point County Park East (to supplement the sand bypassing when needed), and Smith Point County Park West (after short-term beachfill to allow relocation of infrastructure) and also on the Westhampton barrier island fronting Shinnecock Bay.
  - *Reactive Breach Response* – is a plan where action is triggered when a breach has occurred, *e.g*. the condition where there is an exchange of ocean and bay water during normal tidal conditions. It will be utilized as needed when a breach occurs.
  - *Conditional Breach Response* – is a plan that applies to the large, federally-owned tracts within FIIS, where the breach response team determines whether a breach should be closed. Conditional Breach closure provides for a 90 ft wide berm at elevation 9.5 ft. only.

- Beach and Dune Fill

  - Provides for a continuous 90 ft. width berm and +15 ft. dune along the developed shorefront areas fronting Great South Bay and Moriches Bay on Fire Island and Westhampton barrier islands;
  - On Fire Island, the alignment follows the post-Sandy optimized alignment that includes overfill in the developed locations and minimizes tapers into federal tracts.
  - Renourishment – Up to 30 years approximately every 4 years.

**Sediment Management at Downtown Montauk and Potato Road**

- Provides for placing about 120,000 CY on front face of existing berm at each location approximately every 4 years as advance fill to offset erosion;
- The Potato Road feeder beach is contingent upon implementation of a local pond opening management plan for Georgica Pond.

**Groin Modifications**

- Shorten existing Westhampton groins (1-13) between 70 and 100 ft., to increase sediment transport (0.5M to 2M cy) to the west and reduce renourishment requirements.
- Shorten existing Ocean Beach groins.

**Coastal Process Features**

- Project Features that contribute to coastal storm risk management through the reestablishment of the coastal processes are included at seven locations as follow:

    - *Sunken Forest* – Reestablishes coastal protective features by reestablishing the natural conditions of dune, upper beach and bay shoreline by removing bulkhead adjacent to marina and existing boardwalk, regrading and stabilizing disturbed areas using bioengineering and shoreline.

    - *Reagan Property* – Reestablishes coastal protective features by improving natural conditions of dune, upper beach and shoreline by burying bulkhead, regrading and stabilizing disturbed areas using bioengineering, and creating intertidal areas.

    - *Great Gunn* – Reestablishes saltmarsh features by reestablishing hydrologic connections and disturbances.

    - *Tiana* – Reestablishes the bay shoreline natural protective features by reestablishing the dune, saltmarsh, and enhancing the SAV beds.

    - *West of Shinnecock Inlet Interim (WOSI)* – Reestablishes the bay shoreline natural protective features by reestablishing the existing saltmarsh.

    - *Islip Meadows* – Reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connections.

    - *Seatuck Refuge* – reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connection and plantings.

**Adaptive Management**

- Will provide for monitoring for project success, relative to the original objectives and the ability to adjust specific project features to improve effectiveness;
- Climate change will be accounted for with the monitoring of climate change parameters, identification of the effect of climate change on the project design, and identification of adaptation measures that are necessary to accommodate climate changes as it relates to all the project elements.

**Integration of Local and Land Use Regulations and Management**

- Local land management regulations to include enforcement of federal and state zoning requirements, as a necessary complementary feature for long-term risk reduction.

Refer to the Corps' GRR for a more detailed description of the TSP (U.S. Army Corps of Engineers 2016b).

## B. Clarification of Fill Volumes

The Corps' GRR provides the beach fill volumes expected to be placed on project area beaches from borrow areas and from inlet/ebb shoal dredging. However, some of the numbers provided in the Executive Summary (initial fill volumes from borrow areas and inlets) don't match with numbers provided in the body of the document (Table 35 initial fill volumes and Table 39 borrow area initial construction, especially inlet volumes), which also don't match with the numbers provided in the Appendices of the document (Appendix J Table 1 initial fill volumes). The Service requests clarification on the initial, renourishment, and total beach fill volumes proposed to be dredged from the inlets and borrow areas so that the Service is clear on the scope of this project and the associated impacts (removal/burial of benthic invertebrates, stabilization of dynamic habitats, reduction in the amount of sediment entering the bay and associated reduction in formation of SAV and saltmarsh habitats and additional impacts further discussed in Section VIII below).

The Service's tentative total numbers of beach fill (cy) are presented as follows (from GRR):

| | | |
|---|---|---|
| Initial Construction (from Table 39, includes inlets): | | 6,440,000 |
| Total Renourishment Volumes (Appendix J Table 3 w/o inlets): | | + 29,895,155 |
| Renourishment and Initial Construction | Subtotal: | 36,335,155 |

Subsequent total dredged from inlets & ebb shoals (from Executive Summary, bi-annually except Moriches every year)

| | | |
|---|---|---|
| Fire Island Inlet: | 1,360,000 x 14 cycles = | 19,040,000 |
| Shinnecock Inlet: | 275,000 x 14 cycles = | 3,850,000 |
| Moriches Inlet: | 171,000 x 29 cycles = | 4,959,000 |
| | Inlet Dredge Placement Subtotal: | + 27,849,000 |

| | | | |
|---|---|---|---|
| Totals | Renourishment and Initial Construction | Subtotal: | 36,335,155 |
| | Inlet Dredge Placement Subtotal: | | + 27,849,000 |
| | | Total: | 64,184,155 |

The Service requests confirmation of these numbers.

Additionally, the Corps identifies the borrow areas to be used for initial construction. The Service requests identification of the borrow areas to be used for the subsequent renourishment efforts. This information will assist the Service in assessing the impacts of dredging operations in the borrow areas (loss of surf clam and benthic invertebrate populations).

The Service notes that the non-structural aspect is the largest part of the project and the project description provided in the Corps' GRR and EIS provide only a general description of the mainland non-structural components proposed for this project (no information on how the roads will be raised, the amount of wetlands filled, if any, specific areas to be acquired, etc.). The DEIS and GRR do not contain any impact analysis for the non-structural measures and does not identify mitigation or environmental monitoring plan for the major components of the TSP, including beach construction, breach filling, road raising, or house raising that discuss outcomes of their analyses in terms of net conservation benefit or no net loss. The Corps has indicated informally (e-mail) that the plan is to conduct separate environmental assessments in each town as non-structural components are developed. Given this scenario the Service is unable to evaluate potential impacts from this aspect of the project. Accordingly, the Corps will need to prepare supplemental NEPA document(s) once each part of the project is defined , which appears to be in contradiction of the CEQ findings and recommendations that "reach by reach planning was to follow an overall understanding of the environmental consequences of the proposed project, not to precede them."

Summary of Service requests for more information/detail

The Service requests more information/detail on the following elements of the TSP:

- Adaptive management;
- Proposed beach-fill volumes;
- Non-structural measures and associated impact analysis;
- Proposed borrow areas after initial construction;
- Clarification on what conservation/mitigative measures are proposed; and
- The design level of the TSP as presently proposed in the GRR/EIS.

As stated above, the Service requests this information so that we are clear on the scope of this project and the associated impacts (removal/burial of benthic invertebrates, stabilization of dynamic habitats, reduction in the amount of sediment entering the bay and associated reduction in formation of SAV and saltmarsh habitats, and additional impacts further discussed in Section VIII below), as well as the Service's involvement in future assessments as more information is provided.

## C. No-Action Alternative/Future Without Project Conditions

Assumptions

For the purposes of this analysis, it is assumed, in the Future Without Project condition, that the following projects shall continue to be implemented within the FIMP Study Area:

Corps: BCP;

Corps: Westhampton Interim Project (until 2027);

Corps: Fire Island Inlet Federal Navigation Project authorized in 1948 and Shore Westerly Project;

Corps: Moriches Inlet Federal Navigation Channel, Jetty Rehabilitation Project, authorized in 1959;

Corps: Shinnecock Inlet Federal Navigation Channel and Jetty Rehabilitation Project;

Corps: Long Island Intracoastal Waterway Federal Navigation Channel Project;

State: Shinnecock Inlet dune and beach fortification; and

SCDPW: Channel Maintenance Dredging and Beach Disposal.

Non-federal storm damage protection projects are likely to be designed and implemented within the FIMI/FIMP, such as the FIIS Short-term Community Storm Surge Protection Plan and Erosion Control District beach nourishment projects in Southampton. Please note that with sea level rise there may be an economic tipping point at which it will not be feasible for communities to raise the funds for such projects. It is also important to note that due to the high expense of these types of projects, such projects are only going to be done in certain communities.

Ocean Beach/Barrier Islands

On Fire Island, there is an insufficient amount of sediment coming to the island from all potential sources (Psuty *et al.* 2005). Sediment deficits are greatest along the eastern portion of the island, while the central and western areas are buffered due to contributions from an offshore source. In fact, there is no evidence of historic inlets within the central portion (between Ocean Beach and Watch Hill) of Fire Island over the last several centuries (Tanski 2007), suggesting that this portion of Fire Island is relatively stable with regards to the potential for breaching. The recent acceleration of sea-level rise, coupled with the negative sediment budget, will result in continued beach erosion and dune displacement, with greater effects occurring in the eastern portion of the island (Psuty *et al.* 2005). Future sea levels are expected to rise at a greater rate, causing increased frequency of overwash and creation of new inlets/breaches (Hinga 2005) in the FIMI study area (more so in the eastern portion of Fire Island). Small-scale storm damage protection projects and sand by-passing associated with maintenance dredging of the inlets would stabilize the ocean shoreline to some extent, which may minimize/limit the occurrence of overwash and new inlet formation, but presumably at a smaller scale than a FIMP project would due to the smaller volumes of sand.

Increased frequency of overwash and/or breach events could result in the creation of early successional habitat/sparsely vegetated habitat preferred by many shorebirds (piping plovers, least tern, etc.) and annual coastal plants, such as seabeach amaranth, which, if left undisturbed, will likely result in an increase in abundance and productivity of these species (provided areas are properly managed, an issue to be addressed during the ESA section 7 consultation). However, storm damage protection measures (beach nourishment, beach scraping, beach grass planting, and/or sand fencing installation) are likely to occur. The impact of these measures would be dependent upon the scale and frequency of these efforts. If it is a limited area and not at a high frequency there is the potential for an increase in the formation of early successional habitat which would be important for shorebirds.

Barrier islands, such as those within the FIMP study area, move in a continuous process whereby sand is transported across the island from the ocean to the bay, allowing the islands to migrate landward (Tanski 2007) and maintain an elevation that prevents submergence due to rising sea levels (Leatherman 1988).

<u>Bay Intertidal Areas</u>

Increased frequency of overwash and/or breach events could result in the creation of additional tidal wetlands and/or tidal flats in the bays. Additionally, bulkheads, which are common on the bayshore in developed communities, replace natural formations landward of them and prevent sand from entering the littoral drift system, causing sediment starvation/accelerated erosion in unprotected areas downdrift (Nordstrom and Jackson 2005). The accelerated erosion will continue to narrow the width of the barrier island in these areas and potentially cause breaching from the bayside of the barrier island.

**Sea Level Rise and Tidal Marsh Elevation Change**

The NPS-FIIS conducted a monitoring program to quantify marsh elevation change in relation to sea-level rise and to identify factors and/or processes that influence the development and maintenance of Fire Island saltmarshes. Monitoring was conducted in three marsh areas, Great Gun Meadows, Hospital Point, and Watch Hill from August 2002 to May 2007. The NPS-FIIS concluded that all three sites revealed an elevation deficit when compared to sea level rise and that the marshes do not appear to be keeping pace with rates of sea level rise (Roman *et al.* 2007). Sea level rise over the past 60 to 100 years from NOAA water level stations in the vicinity of Great South Bay ranged from 2.52 mm/year to 3.79 mm/year (Roman *et al.* 2007), all greater than measured marsh elevation. These numbers are comparable to Church and White's (2011) 3.2 mm/year global average in 1993. If the observed elevation deficit continues, it is likely that these marshes will become wetter and high marsh vegetation may convert to *Spartina alterniflora* and areas of open water and marsh submergence may increase (Roman *et al.* 2007), which could negate the trend of increased tidal marsh areas found by the NYSDEC. With marsh submergence, soils become waterlogged and anaerobic soil conditions persist, causing plant death, collapse of peat, and ultimate increased flooding (Roman *et al.* 2007). Additionally, there would likely be a landward encroachment of marshes to upland areas, provided that man-made structures (bulkheads) do not impede this migration. This trend may exacerbate if predictions of an accelerated rate of sea-level rise in response to global warming occurs (Roman *et al.* 2007). By 2100, scientists project sea levels 18 to 50 in. higher than today along New York's coastlines and estuaries, though a rise as high as 75 in. could occur (Pendleton *et al.* 2004; New York State Department of Environmental Conservation 2015a)

Overwash is important in allowing marshes to keep pace with sea level rise. The NPS determined that the development of the three marshes in FIIS coincided with the establishment of the Hallets (1788) and Smiths (1773) inlets. Storm-induced inlets and barrier island overwash transport sediment from the ocean and barrier island to the bay. As such, inlets and associated flood tidal deltas support the establishment of back-barrier saltmarsh habitat (Roman *et al.* 2007). The build-up of sediments in breach/overwash areas create sand flats that provide platforms for new salt marsh growth. Additionally, the platforms associated with tidal and sand flats, widen the inlet area that provide additional protection to upland areas from sea level rise (U.S. Army Corps of Engineers 2016a).

Great South and Bellport Bay

Suffolk County monitoring data indicates an improvement in water quality in the Great South Bay due to the implementation of sewage management practices (Hinga 2005) and this trend is likely occurring in Moriches and Shinnecock Bays, as well. Improvements in water quality (fecal coliform, concentrations of nutrients, etc.) may improve the chances of successful shellfish stocking and increase the diversity of biota (finfish, benthic organisms, etc.) in the bays (by increasing flushing and dilution of fecal coliform and nutrients, increasing light penetration, and reducing the potential for brown tide (New York Sea Grant Extension Program 2001). An increase in the occurrence of breaching may also improve water quality in the bays, but would also increase salinity of the bays, which could allow for more predators of shellfish (finfish) to frequent the bays (Tanski 2007).

It is expected that the number and size of bay islands within the FIMP study area will continue to decrease due to storm events, rising sea levels, and erosion.

Inlets/Mainland

As previously stated, the inlets will likely be maintained through maintenance dredging and maintenance of the jetties. On the mainland, rising sea levels could cause the migration of marshes landward, if there is room (possible in undeveloped areas/open space), or cause some submergence of marshes and create more open water areas along the bayshore line.

## VIII. DESCRIPTION OF PROPOSED ACTION IMPACTS ON FISH AND WILDLIFE RESOURCES

### A. Direct and Indirect Impacts

The proposed action has the potential to directly and indirectly adversely impact fish and wildlife resources within the project area and the overall condition of the barrier island due to the reduced likelihood of natural processes occurring unhindered resulting from the Corps' beach nourishment and dune construction project.

Direct impacts include:

- Loss and habitat modification of offshore borrow area and ebb shoal habitats, benthic/fisheries resources, and overwash/early successional habitat as well as accreting spit habitat;
- Burial of marine intertidal and marine beach invertebrate species and temporal modification of intertidal and marine habitats; and
- Temporary increase in turbidity of offshore and intertidal habitats.

Indirect impacts include:

- Decrease in habitat values for federally and state-listed plant and animal species;
- Reduced potential to form and create early successional barrier island habitats;
- Reduced opportunities for water quality improvement in backbay;
- Reduced potential to form new inlet channel habitat;
- Reduced potential to recruit finfish and crustaceans to backbay;
- Reduced sediment transport to the bay;
- Reduced rates of formation of SAV and saltmarsh habitats;
- Accelerated vegetative succession on barrier island and backbay;
- Decreased biodiversity at the community level;
- Development of habitat preferred by mammalian and avian predators; and
- Reduced habitat values for waterfowl and migratory shorebirds.

#### 1. Offshore/Nearshore Communities

A description of the potential physical and biological changes resulting from dredging of borrow areas and their associated direct impacts is given in Minerals and Management Service (2001). Some notable potential biological effects to fish and invertebrates include, but are not limited to, (1) removal or loss of infauna and epifauna at the borrow site for one to five years to a community with comparable pre-disturbance abundance and diversity and biomass but different species composition and structure (Greene 2002); (2) altered energy transfer on the food chain and altered composition of fish prey base; (3) loss of spawning habitat; (4) loss of overwintering habitat; and (5) changes in community structure (species present, diversity, abundance, and biomass in surrounding areas) (Minerals Management Service 2001).

The primary adverse direct impact on the environment due to dredging operations at a borrow area involves the disturbance and destruction of benthic resources and their habitats, which would result in a loss of benthic organisms from the immediate area. Woodward-Clyde Consultants (1975) concluded that dredging may lower the productivity of a borrow area, and thus, the usefulness of the site for the production of fish and shellfish may decrease until a typical community is re-established in the borrow area. Many studies concluded that the benthic community within the borrow area of a dredge operation is fully recovered within one-year, while other studies had found that recovery took more than one year and that species composition was still changing because sediment composition had not returned to pre-dredging conditions (Greene 2002; U.S. Army Corps of Engineers 2016a).

The Corps stated the following in page 4-33 of the DEIS regarding benthic recovery in borrow areas:

> "The West of Shinnecock Inlet Interim (WOSI) borrow site was surveyed by the US Army Corps of Engineers for 3 years following dredged sand used in a beach renourishment (2008). Minor changes in macroinvertebrate species occurrence were identified in pre- and post-construction surveys. For example, the third-most abundant macroinvertebrate prior to dredging was the New England dog whelk (Nassarius trivittatus), which was not observed in the 3 years post construction. Between the borrow site and a control site, however, benthic infauna was most similar the first year after dredging. While there were some differences observed in benthic communities before and after dredging, the ecosystem is likely most influenced by natural fluctuations (U.S. Army Corps of Engineers 2008)."

The loss of the third-most abundant macroinvertebrate is a significant impact to this community.

While borrow area benthic community recovery within borrow area is dependent upon many factors, the sediment composition of the site and the characteristics of the new sediment interface are two important factors that the Corps could consider when selecting borrow sites (Greene 2002).

As previously stated, surf clam surveys conducted in 2001 indicate that this species was present in the project borrow areas . More recent surveys in 2012 confirm surf clam presence within the borrow areas (New York State Department of Environmental Conservation 2013). The greatest concentration of surf clams observed during these surveys were from 0-1 mi. from the ocean shoreline from Fire Island Inlet to Moriches Inlet. Although no borrow areas (at least those identified for initial construction) are present in this portion of the study area, the dredging of the ebb shoal could potentially impact an area with a relatively high concentration of surf clams. Two of the borrow areas (2C and 2H) occur in areas with moderate surf clam concentrations (as of 2012) while the remaining borrow areas occur in areas with lower clam concentrations. Nonetheless, direct disturbance and loss of surf clam populations are likely to occur.

Dredging also directly affects fish by displacing fish populations from the dredging operation site (Woodhead 1992, Minerals Management Service 2000). Fish utilizing borrow pits may potentially be exposed to elevated contaminant levels due to the siltation of contaminated fine material into the borrow pit. Small deep pits are the poorest habitat due to reduced water circulation and high sedimentation rates which could lead to anoxic conditions lethal to species using the pits. However, as indicated in studies by Woodhead and McCafferty (1986), borrow areas and channels often contain higher levels of fish than adjacent shoals, indicating that borrow areas do not demonstrate adverse impacts to resources once the construction period is over.

Decreased water quality and increased turbidity in the marine nearshore subtidal zone could result from the actual beach nourishment activity (Mineral Management Service 2001). Sand particles suspended by dredging are dense and fall quickly back to the bottom while the fine sediments stay in suspension longer than sand, only sinking slowly (Woodhead 1992). Fish tolerance to suspended solids varies by species and by age. Beach nourishment can affect fish populations by delaying hatching time of fish eggs, by killing the fish by coating their gills, and by reducing dissolved oxygen concentrations to stressful levels (Naqvi and Pullen 1982).

Localized turbidity plumes can have lethal and sublethal effects on benthos and fish, including hematological compensation for reduced gas exchange across gill surfaces, abrasion of epithelial tissue, packing of the gut with large quantities of ingested solids which may have little nutritive value, disruption of gill tissues (abrasion, clogging, increased activity of mucosa), and increased activity with a reduction of stored metabolic reserves (Profiles Research and Consulting Groups, Inc., 1980). Other effects of increases in turbidity include a decrease in light penetration, mechanical abrasion of the filter feeding and respiratory structures of animals, possible resuspension of contaminants and nutrients, burial of non-motile eggs, larvae, and adults, and absorption of essential nutrients from the water column (Stern and Stickle 1978).

The potential for oxygen deprivation problems in borrow areas is a very real concern. Reduced water circulation and high siltation/sedimentation of fine material can lead to anoxic conditions lethal to organisms which may be utilizing a borrow pit. These adverse direct/indirect impacts have been found to be minimal in areas with strong currents where oxygen can be quickly replenished (Tuberville and Marsh 1982). Elimination of small deep pit designs can alleviate potential oxygen deprivation problems.

In addition, dredging activities may also directly impact migratory or overwintering seabirds (Minerals Management Service 2001). Seabirds also use these habitats and can experience loss of foraging resources due to dredging, which can result in shifts in foraging patterns. The Minerals Management Service, which oversees exploration of offshore areas for mining, and oil and gas reserves, has recognized the potential impacts of their programs to seabirds and has undertaken, in certain areas of the country, surveys to understand seabird distribution and abundance in their project areas.

2. Marine Intertidal and Marine Beach

Sandy beaches and associated intertidal areas are important habitat for nesting and foraging shorebirds, feeding and nursery grounds for demersal and pelagic surf fish and the prey species they depend on. Effects from beach nourishment may disturb these species causing them to depart or avoid the area; result in the burial of vegetation and benthic invertebrates; increase vegetation succession; or result in physical changes to the habitat such as increased turbidity that may have numerous effects on species.

The FIMP entails the placement of 64,184,155 cy of material over the 50-year project in the primary beach fill/dune construction area.

Recent studies present varied evidence as to both short- and long-term impacts of beach nourishment along the western coast of the Atlantic Coast, and focus principally on beach and benthic/pelagic invertebrate and finfish communities of the western Atlantic Coast (*e.g.*, Mineral and Management Service 2001). On the other hand, relatively little information on the effects of beach nourishment on shorebirds and waterbirds is present in the literature (CZR, Inc. 2003).

Based on the review of the literature, the proposed project has the potential to result in a number of direct and indirect physical and biological impacts in terms of scale and duration in the marine intertidal, maritime beach, and maritime dune communities in the proposed project area. Direct adverse impacts to these communities include, but are not limited to, impacts to breeding and non-breeding avian species through habitat modification, burial of prey resources at the disposal sites, removal of prey resources in the offshore dredging areas, and disturbance of breeding, loafing, roosting, and foraging activities of avifauna.

Potentially beneficial impacts of beach nourishment have been observed at other Corps sites existing on Long Island (wider beaches provide more shorebird breeding areas/growing areas for coastal plants); however, these are not well studied and remain anecdotal as to their long-term contribution to resource conservation.

In addition to the above, direct impacts also include burial of benthic resources due to the covering of these existing habitats with sand (U.S. Army Corps of Engineers 2014b). Peterson and Manning (2001) stated that long-term adverse impacts to benthic fauna at North Topsail Beach, North Carolina, occurred following beach nourishment. Lindquist and Manning (2001) reported that periodic nourishment of these beaches appeared to prevent the full recovery of benthic species.

The timing of dredging and placement of sand during the nourishment activities will also be a major factor regarding short- and long-term impacts for non-endangered shorebird and waterbird species. These effects include disruption of breeding, foraging, and roosting activities (Gill 2007). Beach construction activities are usually very intensive environmentally disruptive operations, which involve the mobilization and use of heavy equipment and vehicles on the ocean beaches. The operation of dredging equipment immediately adjacent to a shoreline that is used as a courtship, nesting, and brood rearing area has the potential to disturb shorebirds to the point where they may not successfully nest and fledge young. Dredging equipment that is operated immediately adjacent to shorebird breeding habitat may preclude shorebirds from using the habitat entirely, forcing them to seek appropriate habitat elsewhere. Operation of machinery used to move dredge pipeline and to grade the nourished beach can greatly disturb shorebirds, their nests, and can endanger the lives of chicks (U.S. Fish and Wildlife Service 1995). However, even low levels of human activity have been shown to result in disturbance and displacement of shorebirds at migration staging and roosting areas (Pfister et al... 1992) and may negatively affect shorebirds and waterbirds by increasing energetic costs, limiting access to important foraging areas and enhancing predation risk which could result in local population declines, lowered body condition, regional habitat shifts and local avoidance behavior (Peters and Otis 2007). Migratory shorebirds are particularly vulnerable to disturbance at roosting sites at high tides where the habitat available for roosting is diminished (U.S. Fish and Wildlife Service 1998). Species that exhibit strong roost fidelity are likely to be most affected by loss of roosting habitat (Peters and Otis 2007). Long-term indirect impacts are likely, as recreational activities would increase as a result of the proposed project. Human activities may adversely affect productivity of shorebirds (Ruhlen *et al.* 2002) and influence foraging activity of some shorebird species (Burger and Gochfeld 1991). Combine this with nourishment cycles for the Fire Island, Moriches and Shinnecock Inlets, the Intracoastal Waterway and Captree Boat Basin dredging, and the remaining projects listed in Section II-A. above, the effect of the FIMP beach placement becomes compounded. The Service is concerned that birds migrating or wintering along newly created beaches would be at risk of not meeting their nutritional needs, which are particularly high during these periods.

The proposed project will also result in changes to the existing dune structure, burial of dune vegetation, and vegetation succession. The proposed project will create a monotypic stand of American beach grass through artificial planting. Cohen *et al.* (2008) reported that mean vegetative cover around piping plover nests on a recently re-nourished Long Island beach was 7.5 percent, and all plovers nested in <47 percent vegetation cover. Although almost 60 percent of nests were on bare ground, nests occurred in sparse vegetation more often than expected based on availability of this habitat type (Cohen *et al.* 2009). Maslo *et al.* (2011) found that most piping plover nests were located in areas with less than 10 percent vegetative cover in the backshore and less than 13 percent in the primary dune. If vegetation succession and increased human disturbance is encouraged, shorebirds will most likely be discouraged from occupying these habitats.

Peterson *et al.* (2014) describes beach nourishment as a “pulse perturbation because it involves the deposition of sediments onto the beach at rates that exceed the capacity of benthic invertebrates to burrow upwards and escape suffocation, starvation and crushing by burial.” As such beach nourishment results in both short term and long term effects to the benthic assemblage within the intertidal and upper beach habitat. Recovery of the benthic infauna is largely dependent on 4 factors: the quality and quantity of the sediment; the nourishment technique and strategy applied; the place and size of nourishment; and the physical environment prior to nourishment (Speybroeck *et al.* 2006), as well as the tidal range, wave energy beach slope, and the sediment grain size (Peterson *et al.* 2014).

Studies completed since the 1970s indicate that recovery time of macrofauna (those animals 0.5 mm or larger in size) is varied and have reported recovery times ranging from 2 months to 2 years (Reilly and Bellis 1983; Bacca and Lankford 1988; Lynch 1994; National Resource Council 1995; Peterson *et al.* 2000; U.S. Army Corps of Engineers 2001; Land Use Ecological Services, Inc., 2005). However, many of these studies have been short in duration and may not provide a comprehensive understanding of the recovery of benthic infauna and little is known about the cumulative effects of repeated renourishments (Speybroeck *et al.* 2006; Peterson *et al.* 2014).

Reilly and Bellis (1978) and Parr *et al.* (1978) noted that when nourishment ceases, the recovery of the community is rapid and complete recovery may occur within one or two seasons. Gorzelany and Nelson (1987) found no significant long-term negative effects of beach nourishment on nearshore benthic fauna during monitoring of a beach replenishment project on a central Florida east coast sand beach community. Peterson and Manning (2001) stated that long-term adverse impacts to benthic fauna at North Topsail Beach, North Carolina, resulted following beach nourishment.

The Corps reported intertidal benthos communities recovered from beachfill impacts within 6 months, and impacts to the intertidal benthic community were more significant when sand particle size of nourished material did not match that of the existing beach, based upon monitoring of beach nourishment impacts on the New Jersey shoreline of the Atlantic Ocean (U.S. Army Corps of Engineers 2001). The Corps' DEIS states that borrow area sediment will be compatible with the FIMP area ocean beach sand (U.S. Army Corps of Engineers 2016a).

The recovery of marine invertebrate prey resources will vary depending on the timing of the fill activity relative to the periods of highest biological activity in these zones of the beach, as well as compatibility of the dredged material with the existing beach substrate. The Corps (1999) examined the effects of beach nourishment on oceanside intertidal benthos in Monmouth County, NJ. They found that the recovery time of the intertidal infaunal community was as short as two months following renourishment carried out between early August and early October. However, studies conducted in Florida, North Carolina, and South Carolina show that re-colonization rates by benthic invertebrates are variable and dependent on the time of year in which the nourishment occurs, beginning within days and taking up to one year for full recovery of some species (Reilly and Bellis 1983; Bacca and Lankford 1988; Lynch 1994; Peterson *et al.* 2000). Areas receiving sand in autumn will likely have a longer prey resource recovery period than areas receiving fill in the winter and early spring. Manning *et al.* (2014) observed seasonal effects of beach nourishment on the mole crab (*Emerita talpoida*), amphipod (*Parahaustorius longimerus*), bean clam (*Donax variabilis*), 3 species of haustoriid amphipods and a polychaete (*Scolelepis squamata*). Recruitment of the mole crab and P. longimerus was negatively influenced when placement occurred before spring recruitment and the recruitment of the bean clam, and 3 species of haustoriid amphipods were negatively affected after placement occurred after spring recruitment. A *S. squamata* responded positively when nourishment occurred after recruitment (Manning *et al.* 2014). Substantial effects of beach replenishment were documented by Woolridge *et al.* (2016) who observed only 48 percent as many invertebrates in the nourishment area compared to the control after 15 months and major impacts to the community composition were observed through the end of the study.

Furthermore, the macrofaunal community after re-colonization 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).

Meiofauna (animals smaller than 0.5 mm [0.02 in.] and equal to or larger than 0.062 mm [0.002 in.]) tend to recover very slowly from a major disturbance, perhaps due to their slow reproduction, limited ability to migrate, and their highly specialized adaptations to a restricted environment (Naqvi and Pullen 1982). However, meiofaunal recovery can be rapid following minor disturbances (Naqvi and Pullen 1982). Few studies have focused on the impacts to primary producers (Cahoon *et al.* 2012).

Abundance, species richness and diversity of macrobenthos were significantly lower on beaches impacted by off road vehicles (ORV) (Schlacher and Thompson 2008). ORV use results in reduced abundances of prey resources in wrack habitat as a result of mortality, displacement or lowered total amount of wrack, (Kluft and Ginsburg 2009). Within the project site, ORV use occurs in Smith Point County Park, throughout the FIIS, and along beaches within the Towns of Southampton and East Hampton. The continuation and possible increase of ORV use within the project site following implementation of the proposed project may affect the recolonization rates of macrobenthos. As such additional research is needed to evaluate recolonization rates under varying driving conditions.

The proposed action will bury the benthic organisms present within this community and it could take up to 2 years for this community to recover, however, Woolridge *et al.* (2016) cautions against making broad generalizations about the magnitude and duration of replenishment effects and recovery time based on the variations between beaches. The loss of these organisms will impact finfish and shorebirds which feed on these organisms, many of which depend on this seasonally dense prey source during migration and breeding. Peterson *et al.* (2006) documented lower abundance of ghost crabs and foraging shorebirds with ghost crabs half as abundant and foraging shorebirds 60-95 percent lower on nourished beaches than control beaches.

These impacts from the proposed project are compounded by nourishment associated with the maintenance dredging projects described above. The project could also directly impact fish communities by increasing turbidity in the placement area.

Sandy beaches are important habitat for nesting and foraging shorebirds, feeding grounds for demersal and pelagic surf fish and the prey species they depend on. Manning *et al.* (2014) found elevated turbidity within the surf-zone during and occasionally after the deposition of sediment during beach nourishment activities. Suspended solids in water can affect the fish population by delaying the hatching time of fish eggs (Schubel and Wang, 1973), killing the fish by coating their gills, and by anoxia (O'Connor *et al.* 1976). Sherk *et al.* (1974) found that demersal fish are more tolerant to suspended solids and filter-feeding fish are least tolerant, giving an advantage to demersal fish and a disadvantage to filter feeders.

Mobile organisms, such as fish, appear to be the least affected by beach nourishment activities as they are able to move to avoid disturbances (Hurme and Pullen 1988). Such motile species are able to return to the area when conditions are suitable again. However, visually orienting predatory fishes and diving seabirds may avoid turbid waters more than species that are ambush predators (Manning *et al.* 2014). Wilber *et al.* (2003) documented localized attraction by northern kingfish and avoidance by bluefish to beach nourishment areas. Avoidance of these areas may increase energetic costs, enhance predation risk which may result in lowered body condition and decreased fitness.

The Service emphasizes the need to quantify the long term effects of projects similar to the FIMP. Pre-project, during construction, and post-construction studies need to be completed to assess benthic invertebrate recovery, and impacts to migratory and wintering shorebirds as well as finfish.

Recreational Impacts to Fish and Wildlife Resources

The ORV access is authorized by: the NYSOPRHP in RMSP; the NPS in FIIS; by Suffolk County in Smith Point County Park, Tiana Beach, Shinnecock West and East; Southampton Trustees in Southampton and Easthampton Town Board and Trustees in the Town of Easthampton. Each of these entities allow for ORV access while also managing their beaches for federally and state-listed ground nesting shorebirds during the plover breeding season, including the restriction of vehicle access when unfledged piping plover chicks are present. Due to Hurricane Sandy, the expanse of ocean-to-bay overwash areas in Smith Point County Park are some of the highest for ecological value, providing habitat for the federally-listed threatened piping plover and seabeach amaranth, as well as the state-listed least tern (threatened), common tern (threatened), and black skimmer (state species of special concern), and the American oystercatcher, a ground-nesting shorebird which breeds in this habitat as well (U.S. Fish and Wildlife Service 1996b). The federally-listed seabeach amaranth (threatened), as well as other coastal plants, grows in this habitat as well (U.S. Fish and Wildlife Service 1996a). Although recreational activities are beyond the jurisdiction of the Corps, these activities and associated management may affect the success of the Corps conservation measures in this area. The Service notes that all overwash areas within the FIMI/FIMP study area will be/has been altered by dune construction).

3. Dunes and Swales

The Corps' recommended beach fill/dune construction plan could have significant direct and indirect impacts on barrier island vegetation present within the project area. The deposition of material and stabilization of the shoreline would alter, and could limit the creation of, sparsely-vegetated overwash areas and inter-dunal swales. Proposed dune alignments would occur in extensive sparsely vegetated overwash areas created by Hurricane Sandy. The Corps has incorporated some project features to diversify the shoreline; however, the simplified shoreline proposed in the remainder of the project area would not provide the range of habitat features critical to species diversity on the barrier islands that are created and maintained through natural coastal processes, including cross island sediment transport.

This simplified shoreline would represent a loss of biodiversity at the community level, if not at the species level. Denser grassy vegetation, an attractive habitat for many mammals, could make the project area less suitable for nesting shorebirds, including the federally-listed piping plover and state-listed common and least terns, black skimmer, and American oystercatcher. In addition, several species of reptiles that use seashores during their egg laying life stages, including the Eastern mud turtle and the diamondback terrapin, could be adversely affected by this predicted habitat change.

The seashore habitat includes open sandy beaches, sand flats, mudflats, and dunes, the latter covered with beach grass (Bull and Farrand 1977). Nesting shorebird populations have declined severely and several shorebird species are either in danger of or threatened with extinction. A number of birds that are known to use this habitat are either federally-listed (roseate tern and piping plover) or state-listed (least tern and common tern). Other breeding birds, such as the American oystercatcher (Melvin *et al.* 1991) and black skimmer (Safina and Burger 1983), are also affected by human activity on Atlantic Coast beaches. Though not currently state- or federally-listed, the reliance of these species on this habitat puts them at risk for population decline which could warrant future listing. The current trend on Long Island south shore beaches to foster stabilization activities is adversely affecting those species (plovers, terns, seabeach amaranth, etc.) that are dependent on dynamic changes to the barrier beach.

The FIMP shoreline design profile is an uninterrupted, unconsolidated, trapezoidal feature. Interdunal habitat and its diversity of microhabitats and microclimates that would normally be found in the sheltered low areas between dune crests, are not proposed for this project. The loss of niche habitats represented by the replacement of the existing beach surface with a more uniform system represents a significant change in habitat quality and diversity.

The amount and type of vegetation on the surface of the barrier islands is largely controlled by the amount of sea spray and overwash. The amount of saltwater exposure defines the type of vegetation that can survive in a given location, contributing to habitat patchiness and diversity. Several shorebirds, including the piping plover, the least tern, and the black skimmer, and reptiles such as the northern diamondback terrapin, must nest in areas where overwash regularly thins or clears away the vegetation. By reducing the frequency and extent of overwash, the FIMP would also limit/eliminate this ecologically critical beach clearing function, especially if land managers install sand fencing and supplemental vegetation plantings occur during post-construction phases of the project. The Corps recognized the importance of cross island sediment transport in their DEIS, stating that each of the coastal processes "are critical to the development and sustainability of the various coastal features which form the natural system" (U.S. Army Corps of Engineers 2016a). The Corps also recognized that the TSP will limit/prevent overwash/cross island sediment transport and cause the "dune-swale complex to be built-up"( U.S. Army Corps of Engineers 2016a). While the DEIS indicates that overwash habitats are optimal habitats for listed species in the study area which is well known from research spanning back to the late 1980s (Patterson 1988; Loergering and Fraser 1995; Elias *et al.* 2000; Cohen *et al.* 2009), the TSP does not evaluate alternatives that would allow for the formation of these habitats beyond federal properties on Fire Island.

The project area contains a federally-listed threatened plant, seabeach amaranth, which colonizes areas created by overwash and breaching. The Recovery Plan for this species (U.S. Fish and Wildlife Service, 1996b) states that "any stabilization of shoreline is detrimental for a pioneer, upper beach annual whose niche or 'life strategy' is the colonization of unstable, unvegetated, or new land, and which is unable to compete with perennial grasses." On North Carolina's barrier islands, the zone where seabeach amaranth is absent corresponds almost exactly with the presence of an artificial barrier dune built and maintained by various federal agencies from the 1930s to 1950s (U.S. Fish and Wildlife Service 1996b). Because seabeach amaranth survives by colonizing new patches of suitable habitat, these new patches must be extensive enough and close enough to each other for the plant to propagate. Fortifying a lengthy portion of the barrier island shoreline may preclude the survival of seabeach amaranth and similar plants, such as seabeach knotweed (*Polygonum glaucum*), throughout the barrier island system. Refer to the Service's biological opinion for this project for more detailed information and analysis.

The most likely change in vegetation patterns in the dune and swale communities would be from sparsely vegetated beach to vegetated beach and grassland. This would alter the competition among species for this area, favoring bird species which have adapted to more heavily vegetated beach areas elsewhere, particularly black-backed gull, herring gull, and ring-billed gull (*Larus delawarensis*). Each of these species are common on today's beaches and prey upon unfledged plover, skimmer, and tern chicks. Densely vegetated areas also serve as habitat for the red fox and raccoon, two highly effective mammalian predators that have flourished on beaches associated with human recreation and development. The presence of both the gull and mammalian predators has contributed to the decline of plover and tern populations. Common species able to tolerate denser stands of beach grass would tend to displace and prey upon rarer species requiring bare or sparsely vegetated sand, which represents a potential loss of species diversity for the barrier beach/backbay community.

4. Terrestrial Upland

Increasing thicket vegetation at the expense of sparsely vegetated beach would change the species distribution on the barrier islands. The net result would favor mammals, which have already adapted relatively well to the human presence on the barrier islands, and the species of birds and reptiles found on the Long Island mainland, over the remaining examples of seaside species. The Corps' preferred alternative would result in the reduced probability of overwash and inlet formation, resulting in an increase in vegetation density, leading to thicket formation, favoring bird species such as the American robin, song sparrow, mourning dove, and gray catbird. McCormick & Associates (1975) identified the following reptiles as using thickets on Fire Island as probable breeding habitat: box turtle, Eastern hognose snake, and black racer. They tend to favor moist, shaded environments. The black racer is the most indiscriminate predator, eating rodents, small birds, lizards, snakes, frogs, and insects (Conant and Collins 1991).

The mammals of the barrier islands would be afforded a great increase in nesting and forage habitat by any increase in dense, woody vegetation. The following mammals have been identified as breeding in thicket or woodland habitat (McCormick & Associates 1975): Opossum (*Didelphis marsupialis*), short tailed shrew (*Blarina brevicauda*), Norway rat, red fox, and long tailed weasel (*Mustela frenata*). Several of these animals are omnivorous, and all will eat birds if they can catch them (Godin 1977). Unfledged birds are particularly vulnerable to this predation. Herbivorous mammals in the area include Eastern cottontail, grey squirrel, and white-tailed deer. Small mammals are an important component of the prey base of migrating birds during the spring and fall.

A potential positive impact of the proposed action is the protection of the Maritime Holly Forest at Sunken Forest within FIIS. Sunken Forest is the northernmost holly-dominated maritime forest on the Atlantic barrier island chain. This community is considered globally rare by TNC (National Park Service 2009). Although no beachfill is proposed in front of this community, the addition of sand updrift (east) of this community could result in a wider beach and more storm damage protection over time.

5. Bay Intertidal

The Corps' recommended beach fill/dune construction plan has the potential to indirectly impact fish and wildlife resources by potentially altering the balance between marsh creation and marsh loss in the adjacent backbay habitats. The impact from the FIMP depends upon the extent to which the plan achieves the stated goal of reducing overwash and inlet/breach formation within the project area. If the project is effective, the potential to form saltmarsh would be reduced. The NPS determined that the development of the three marshes in FIIS coincided with the establishment of the Hallets (1788) and Smiths (1773) inlets. Storm-induced inlets and barrier island overwash transport sediment from the ocean and barrier island to the bay. As such, inlets and associated flood tidal deltas support the establishment of back-barrier saltmarsh habitat (Roman *et al.* 2007). The loss of plant detritus producing regions of the estuary such as Spartina marshes will greatly lower the productivity of the estuary and directly limit its potential to produce commercially important species of fish and crustaceans (Odum 1970).

Cashin Associates (1993) points out that tidal marsh areas near active, migrating inlets will stay in the early stages of vegetative succession, maintaining their highest rate of organic production and export to the estuary. In comparison, long-term stability will result in decreased productivity. Beach nourishment reduces the potential for the creation of new wetlands by reducing the frequency and extent of natural barrier island processes (Cashin Associates 1993). Without new inlet formation to compensate for wetland loss, tidal wetlands will eventually decline in the area. The TSP places priority of dunes and beach building over saltmarsh and wetland habitats in general. Saltmarsh habitat will be impaired by lack of sediment being moved onto it from overwash and thus will be unable to keep up with sea level rise and subsidence. Conservation of marsh birds, such as the sharp-tailed saltmarsh sparrow, a species of highest conservation concern in the northeast and mid-Atlantic States need to be integrated into this plan in order to ensure there is a net conservation benefit, or at a minimum, no net loss of their habitats.

If the FIMP reduces the frequency and extent of inlet/breach formation and overwash, the ground elevation rises from aeolian transport above the tidal range and barrier-flat grasses and shrubs colonize the washover surface (Leatherman and Allen 1985a). Overtime, the build-up of sediments in the inlet areas create sand flats that provide platforms for new salt marsh growth. Additionally, the platforms associated with tidal and sand flats, widen the inlet area that provide additional protection to upland areas from sea level rise" (U.S. Army Corps of Engineers 2016a). The Corps' DEIS states that the TSP would result in "less sediment input within the estuaries adjacent to the barrier islands, which would decrease the long-term formation of salt marsh and submerged aquatic vegetation" (U.S. Army Corps of Engineers 2016a). As discussed above in the Dunes and Swales section, if the recommended plan reduces the probability of an overwash, there is likely to be a major change in both the plant and animal communities. If both overwash and inlet formation processes are impacted, marsh will still be lost to rising sea level and bayside erosion, again without compensating marsh formation. The Corps also states in their DEIS

(Appendix I - U.S. Army Corps of Engineers 2016a) the following regarding importance of cross island sediment transport:

“From a geologic perspective breaches are episodic events that help form the coastal barriers by depositing sediment in shoals that widen the barrier and form a platform where aquatic plants help accumulate sand. Washovers, or sand driven up onto the barriers during storms, also help build sand volume. Management efforts that prevent breaches and washovers may destabilize the barriers by preventing retreat in response to sea level rise. The shore face will continue to erode and steepen, while the bayshore will shrink with encroaching sea level and lack of sediment input. This combination of factors could lead to thinning the barriers, loss of volume and possible catastrophic breaches in a major storm.”

The Corps provided an estimate of the bayside deposition above mean sea level (MSL) that would occur as a result of breaching at 10 Corps-identified areas of concentrated risk for storm damages (U.S. Army Corps of Engineers 2009a) in acres and volume of material (two of which are within the Old Inlet breach area). The Corps’ GRR (U.S. Army Corps of Engineers 2016b) only provided volumes of bay deposition which are identical to the volumes provided in their 2009 report. As such, the aerial extent of deposition provided in the 2009 report is deemed valid for this analysis. These deposition areas above MSL and presumably within the intertidal zone, created if a breach was left open for 12 months, are listed as follows:

| **Site** | **Acres of Bayside Deposition Above MSL after 12 Months** |
|---|---|
| Fire Island Lighthouse Tract | 51 ac. |
| Town Beach to Corneille Estates | 68 ac. |
| Talisman to Water Island | 68 ac. |
| Davis Park | 125 ac. |
| Smith Point County Park | 17 ac. |
| Sedge Island (Westhampton) | 25 ac. |
| Tiana Beach | 12 ac. |
| West of Shinnecock Inlet | 11 ac. |
| **Total** | **377 ac.** |

6. Bay Subtidal

Barrier island and coastal processes, including breaches and inlet formation, may positively affect water quality in the backbay area within the project area by reducing the number of waterborne pathogens from tidal exchange, reducing turbidity, and moderating bay temperatures. All of these could prove favorable to the production of shellfish, especially the hard clam. However, the Corps' recommended plan is designed to reduce the frequency and extent of such processes, a potential indirect impact of the proposed action.

The Corps (1995) has expressed concern that a breach within the project area may cause changes in bay salinity that would be damaging to shellfish, and New York Sea Grant concluded that breaches would have both negative and positive impacts on the hard clam (New York Sea Grant Extension Program 2001). The salinity and temperature changes (as described in Section VI) could slow the development of fertilized eggs and larvae as well as increase mortality and the abundance of shellfish predators (channel whelks and moon snails) (New York Sea Grant Extension 2001). However, larger oceanic plankton species may improve food quality and more moderate winter water temperatures may decrease over-winter mortality (New York Sea Grant Extension 2001). There was a significant increase in shellfish populations in Moriches Bay after the two breaches occurred in 1992 (S. Kiernan, pers. comm. 2000). Increased salinity allows for an accelerated rate of shellfish growth and improved larval development (Cashin Associates 1993). Higher salinity appears to be more favorable to hard clam growth at non-optimal temperatures (>30 or <20°C) (Malouf 1991). Growth rings on hard clams in Bellport Bay were reported to be larger in 2013 than in pre-breach conditions (Gobler, pers. comm. 2014).

Increased tidal flushing in the bay resulting from a breach within the project area could reduce the number of waterborne pathogens in shellfish growing areas present within each of the bays, leading to a possible reduction in the number of areas now closed to commercial and recreational clamming (Cashin Associates 1993). Cashin Associates (1993) also notes that increased flushing reduces turbidity, which may have positive effects on both shellfish and eelgrass. Turbidity also affects the feeding efficiency of filter feeders such as the hard clam (Schubel 1991). Many bivalves, including hard clams, have the ability to sort the food particles (phytoplankton) from the nonfood particles (silt) that they filter out of suspension (Bricelj and Malouf 1984), but hard clams tend to respond to increasing silt loads by reducing their filtration rates (Bricelj and Malouf 1984). Therefore, it appears that hard clams are less well adapted for survival in a turbid environment than many other bivalve species and are more dependent on less turbid waters, conditions that would occur with a breach.

As light penetration is a major limiting factor affecting the primary productivity of submerged aquatic vegetation in the bays (U.S. Fish and Wildlife Service 1996), reduced turbidity associated with increased tidal flushing could increase light penetration and with it, primary productivity and the habitat structure that submerged aquatic vegetation provides. Although the breach at Old Inlet did result in the burial of eelgrass beds in the immediate vicinity, increases in water quality due to increased flushing of Great South Bay may lead to an increase in vegetated bottoms elsewhere in the bay. Sediment passing through a new inlet/breach would create sand flats elevated above the bay bottom, potentially compensating for some of the eelgrass area that will be lost to increased water depth. In this manner, a new inlet could be beneficial to the eelgrass population of the bays by providing new substrate for growth. For example, the densest eelgrass beds in Great South Bay are near the existing inlets (Cashin Associates 1993). This has been attributed to the clearer water and sediment input which is suitable for eelgrass development available in these locations. It is possible that a new inlet could more than compensate for short-term physical damage with a long term improvement in conditions.

The introduction of additional ocean water through a breach in the project area might also moderate bay temperature (Cashin Associates 1993), as the annual temperature range for ocean water is from 4 to 21°C (U.S. Fish and Wildlife Service 1981a), narrower than the bay water temperature range of 0 to 30°C. Hard clam growth is disrupted outside of the optimal temperature range, approximately 20 to 23°C (Malouf 1991). Moderation of bay temperature would tend to reduce these disruptions (Cashin Associates 1993).

Finfish would be largely unaffected by a breach within the project area, although the new channel might provide attractive habitat for certain species (New York Sea Grant 2001). Unvegetated bay bottom is the preferred habitat of several benthic fishes. Sogard (1992) found that juvenile winter flounder were more abundant in unvegetated habitats than in eelgrass habitats; there was also some suggestion that winter flounder may grow faster in unvegetated habitats with coarse sediments. However, flounder populations are not limited by any shortage of non-vegetated bottom habitat (New York Sea Grant Institute 1993), and the flounder population would not be increased by the creation of more non-vegetated bottom area.

The Corps provided an estimate of the bayside deposition below mean sea level (MSL) that would occur as a result of breaching at 8 Corps-identified areas of concentrated risk for storm damages (U.S. Army Corps of Engineers 2009a) in acres and volume of material. The Corps' GRR (U.S. Army Corps of Engineers 2016b) only provided volumes of bay deposition which are identical to the volumes provided in their 2009 report. As such, the aerial extent of deposition provided in the 2009 report is deemed valid for this analysis. These deposition areas below MSL created if a breach was left open for 12 months, are listed as follows:

| **Site** | **Acres of Bayside Deposition Above MSL after 12 Months** |
|---|---|
| Fire Island Lighthouse Tract | 338 ac. |
| Town Beach to Corneille Estates | 274 ac. |
| Talisman to Water Island | 171 ac. |
| Davis Park | 314 ac. |
| Smith Point County Park | 117 ac. |
| Sedge Island (Westhampton) | 165 ac. |
| Tiana Beach | 83 ac. |
| West of Shinnecock Inlet | 74 ac. |
| **Total** | **1,536 ac.** |

The FIMP is, therefore, designed to prevent the formation of a total of approximately 1,536 ac. of bayside habitat, including the above described 377 ac. of intertidal/supra-tidal habitats described above. This is total amount of habitat that could potentially form if breaches were to occur at each of the areas of concentrated risk and left open over a period of 12 months. The Service recognizes that this estimate could be less since there is also the potential that: 1) a breach would not form in each of these locations over the 50-year life of this project and; 2) should breaches occur, they could close naturally at any time prior to 12 months. Conversely, this total could be conservative in that it would not include ocean-to-bay overwash habitat that could also be created across the existing barrier island in the event of severe storms and the potential for breaches to provide additional sediment beyond 12 months if it hasn't reached equilibrium. The Corps determined that there is a combined total of 7.4 breaches expected to occur over the 50 year time frame of the FIMP (U.S. Army Corps of Engineers 2016b).

It appears that the existing breach at Old Inlet is present in the area the Corps refers to as Old Inlet (West). Based upon delineations of Google Earth 2015 aerial photographs, the Service estimates that a total of 525 ac. of back-bay tidal shoal habitat has been created thus far at the Old Inlet Breach (three years after its formation). Due to its dynamic nature, it's difficult to know if this amount could increase as the breach migrates or the breach could close naturally in the near future (or be closed by the Corps pending NPS's EIS). In their 2009 Formulation Report, the Corps had forecasted that a breach at Old Inlet would create 622 ac. if left open for 12 months. Although the forecasted value was greater than what was actually created, this comparison does validate the premise of using these Corps' forecasted values in assessing the impacts of this project.

7. Bay Islands

As stated above, the NYSDEC analysis did find a substantial loss of bay island tidal wetlands (both man-made dredge deposition islands and natural islands) within the FIMP area. The loss of these islands appears to be caused by storm events, rising sea levels, and erosion. Erosion may be caused by: a) the apparent deficit of sediment in the bays due to maintenance dredging activities (Intracoastal Waterways and each of the inlets), b) the maintenance of relatively deep channel depths for navigation which increase tidal flow velocities, and c) boat wake reflection. Although some back-bay islands were created from dredge placement activities (New Made Island), these back-bay islands are important habitat for colonial waterbirds, piping plovers, American oystercatchers, and heron rookeries.

Dune building projects restrict the delivery of sediment to the bay by inlets/breaches, wave overwash, and Aeolian transport, thereby increasing bay sediment budget deficiencies and potentially increasing bay island erosion and/or loss (Nordstrom *et al.* 2005).

8. Inlets

The FIMP does not reduce the amount of presently available channel habitat, but is intended to reduce the likelihood of formation of any new inlet channel habitat associated with a breach within the project area. Inlet channels, and their attendant physical features, appear to be preferred habitat for bluefish and may provide essential foraging habitat for black skimmers, common terns, and roseate terns. The roseate tern is a federally-listed endangered species. Safina (1990a and b) found that common terns were able to take advantage of prey that had been driven to the surface by bluefish, which tend to congregate near inlets, while roseate terns relied on physical features associated with inlet channels, such as shoals, which cause prey to move up into their diving range.

Although the interim BCP was intended to close any new inlet quickly, short-term impacts of a breach may be ecologically important, including the habitat provided by the temporary existence of the new channel itself and the changes in bottom topography due to delivery of new sediment to the back bays.

The Corps proposes to incorporate the maintenance dredging of Fire Island, Moriches, and Shinnecock Inlets, normally conducted under separate authorities through the Operations Division of the Corps, into the FIMP project (Planning Division). These maintenance dredging projects are proposed to be expanded/increased in the following manner (U.S. Army Corps of Engineers 2016b):

- These dredging efforts will now include the dredging of the ebb shoals of each inlet, outside navigation channel, with downdrift placement (presumably in the same placement areas used in the Operations Division maintenance dredging projects);

- These dredging efforts will now include the construction of a +13 ft dune and berm, as needed in identified placement areas;

- These inlets will be dredged on a 2-year cycle (the Operations dredging would occur irregularly, averaging approximately once every 5-6 years).

The expansion of these maintenance dredging projects will further stabilize the placement areas, thereby exasperating FIMP projects impacts. Additionally, the removal of the ebb shoals could remove potential sources of sediment downdrift of the inlets as well as the flood shoals and result in accelerated erosion in these areas. Any modification of the inlet systems has the potential to alter the flooding hazard. The TSP proposes to include the dredging of 73,000 to 379,000 cy from the ebb shoal in addition to deepening the navigation channels of each inlet as part of the scheduled Operations and Maintenance dredging at a two year interval. The Corps should address the potential for this proposed practice to exacerbate the flooding hazard associated with the management of the federal inlets.

Ebb and flood shoals are spawning areas for crab and shrimp species, roosting and foraging habitat for shorebirds, shelter for SAV (Rice 2009) and ebb shoals support benthic invertebrates which are important prey species for commercially important demersal fish and crustaceans (Bishop *et al.* 2006)

One impact to the Fire Island Inlet area in particular, is the bi-annual removal of the accreting spit located west of the Fire Island Inlet Jetty along part of what is referred to as Democrat Point. As the Service had documented in our August 24, 2006, correspondence (U.S. Fish and Wildlife Service 2006 *in litt*.) to the Corps (Operations Division), the dredging of the accreting spit removes important foraging and breeding habitat for federally and state-listed shorebirds such as the piping plover (U.S. Fish and Wildlife Service 1996) and least tern, while the areas inland of the spit stabilize and dense vegetation encroaches, thereby limited habitat suitability for these species.

The expansion in the depths of the inlets and the dredging of the ebb shoal could result in the increase of tidal flushing and potentially an improvement in local water quality, but could also increase the flooding potential along the mainland.

It is not clear if the Operation Division-sponsored maintenance dredging of these inlets will continue or if this dredging will solely be conducted through the FIMP project.

9. Disruption of Physical Processes and Habitat Formation

As described in Section III-C-3, the physical process of overwash is important in maintaining/creating fish and wildlife habitat (SAV beds, tidal wetlands, sparsely-vegetated ocean-to-bay overwash fans, etc.) and the very goal of the FIMP is to prevent/limit this very coastal process.

## B. Cumulative Impacts

As a preface to the discussion below, Berg (1977) and Hobbs *et al.* (1981) noted that the FIMP Reformulation Study, as initiated in 1980, was intended to address the entire barrier system as a unit, because action under a comprehensive plan that considers the erosion processes over the full length of the receding shore segment is both more effective and more economical, and because, as the CEQ noted, actions in one part of the system tend to affect other parts of the system.

The Corps' cumulative impact analysis for the FIMP (U.S. Army Corps of Engineers 2016a) included the following summarized conclusions:

- The cumulative impact assessment of federal nourishment projects on the south shore of Long Island indicate that federal project actions would occur in a dynamic environment whose inhabitants have adapted to these conditions.
- Studies indicate that borrow area and sand placement areas re-colonize shortly after construction activities are completed.
- Best Management Practices/conservation measures (Time-of-year restrictions, place only suitable material on beaches, properly graded, etc.) will lessen temporary impacts;
- The proposed borrow areas in the TSP Alternative represent a very small percentage of the total available habitat.

Agency Planning/Environmental Analysis

As described in the Service's Mitigation Policy, the Service must consider project impacts as part of its review, including: (1) the total long-term biological impact of the project, including any secondary or indirect impacts regardless of location, and (2) any cumulative effects when viewed in the context of existing or anticipated projects. Direct impacts occur in the same place and location. Indirect impacts can occur later in time or farther removed in distance, but are still reasonably foreseeable. The CEQ-defined cumulative impacts (40 CFR 1508.7) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...." Also, "...cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time."

Shoreline stabilization projects in the form of beach nourishment have been undertaken on Long Island since the 1920s. For example, since the 1930s, the beaches on Fire Island have been stabilized via sand fence placement, dune construction, jetty construction, and beach nourishment. The first large-scale dune and beach construction was undertaken in the developed

FIIS communities in the late 1940s (Gravens 1999). It is estimated that a total of 6.9 m cy of beachfill was placed along Fire Island from 1933-1989 (Gravens 1999).

If the WOSI, the FIMI, the BCP, the Westhampton Interim Project, and the Westhampton groin field are considered together, the Corps' interim projects would encompass nearly 50 mi. of the original 83-mi. FIMP study area. Recent (since 2008) federal projects or federally-authorized projects within or adjacent (Long Shore current updrift) to the FIMP are listed as follows:

| Year | Project Name | Cubic Yards (cy) | Project Distance (ft) |
|---|---|---|---|
| 2015 | Village of Quogue Beach Nourishment Project | 1,100,000 cy | 14,325 ft |
| | Captree Boat Basin Great South Bay Initial | 122,600 cy | 12,000 ft |
| | Captree Boat Channel Great South Bay Second | 75,000 cy | |
| | Tiana Beach Levee | 100,000 cy | 3,500 ft |
| 2014 | Downtown Montauk Stabilization Project | 65,000 cy | 3,100 ft |
| | Great South Bay Federal Navigation Channel Dredging | 100,000 cy | 3,000 ft |
| | FIMI | 7,000,000 cy | 100,320 ft |
| 2013 | East Captree State Channel Modification 1 | 489,000 cy | 12,000 ft |
| | East Captree State Channel Modification 2 | 400,000 cy | |
| | New York State Department of Transportation Fire Island Inlet Dredging | 800,000 cy | 50,000 ft |
| | Corps Emergency Fire Island Inlet Dredging | 1,500,000 cy | 40,000 ft |
| 2008 | FIIS Community Project | 1,800,000 cy | 22,000 ft |
| | Smith Point and Cupsogue County Parks | 460,000 cy | 15,000 ft |
| 2003 | FIIS Community Project | 1,000,000 cy | 15,000 ft |
| 2002 | Fire Island Pines Marina Dredging | 6,000 cy | 6,000 ft |
| 2001 | West of Shinnecock Inlet Interim | 810,000 cy | 4,000 ft |
| 1999 | West of Shinnecock Inlet Interim | 810,000 cy | 4,000 ft |
| 1994 | Westhampton Interim Project | 3,500,000 cy | 21,500 ft |
| | **Total** | **20,137,600 cy** | **325,745 ft** |

Therefore, over 20 million cy of material have been dredged and placed along over 60 mi. of ocean beaches within and adjacent to the FIMP project area since 1994. The FIMP project would contribute an additional 64,184,155 cy of material over the 50-year project life. Additionally, the continued implementation of the above projects that are authorized for future dredging/nourishment that will not be super-ceded by the FIMP (at a minimum- bay dredging projects) will contribute additional material as well. This amount of material resulted in direct and indirect impacts summarized as follows:

Direct impacts include:

- Loss and habitat modification of offshore borrow area habitats, benthic/fisheries resources, and overwash/early successional habitat;
- Burial of marine intertidal and marine beach invertebrate species and temporal modification of intertidal and marine habitats; and

- Increased turbidity of offshore and intertidal habitats.

Indirect impacts include:

- Decreases habitat values for federally and state-listed plant and animal species;
- Reduces potential to form and create early successional barrier island habitats;
- Reduces opportunities for water quality improvement in backbay;
- Reduces the potential to form new inlet channel habitat;
- Reduces the potential to recruit finfish and crustaceans to backbay;
- Reduces sediment transport to the bay;
- Reduces rates of formation of SAV and saltmarsh habitats;
- Accelerates vegetative succession on barrier island and backbay;
- Decreases biodiversity at the community level;
- Develops habitat preferred by mammalian and avian predators;
- Reduces habitat values for waterfowl and migratory shorebirds;
- Potential for snow fencing, planting of vegetation, and beach raking;
- Increase in recreational activity.

It is not clear if the FIMP will supercede and prohibit other beach nourishment projects from occurring within the study area. Additional beach nourishment/dredge material placement projects will compound the above listed impacts, especially the recovery of benthic invertebrate species in borrow/dredge and placement areas. It will be more difficult for the benthic communities to recover in these areas if more frequent beach nourishment and maintenance dredging operations are occurring. As stated above, recovery of this community could take up to 2 years, which, for example, is the dredging cycle for the Fire Island and Shinnecock Inlets (every year for Moriches Inlet). So just as benthic communities (important for fish, shorebirds, sea turtles, etc.) are recovering, another dredging and beach placement operation is occurring. If additional beach nourishment projects occur, the benthic communities could potentially not have time to recover.

The FIMI, Westhampton Interim Project, Village of Quogue, Sagaponack/Bridgehampton Erosion Control District and Fire Island Community projects involve the dredging of an offshore borrow area with placement on the ocean shoreline. The remaining projects involve the dredging of backbay/flood shoal and/or inlet and ebb shoal areas with dredge material placement on the ocean shoreline or stockpiled within the vicinity of the ocean shoreline. This removal of sediment from the backbay and inlet habitats is further exasperated by the limiting/prevention of cross-island sediment transport (overwash and breaching) that occurs from the cyclical nourishment of these ocean beaches.

As such, the Service concludes that the beach fill/dune construction plan will have cumulative impacts causing adverse impacts on fish and wildlife habitat and the overall condition of the FIMP project area through reduction in the frequency of coastal processes which maintain the barrier islands as natural protective features. Coastal processes keep the barrier island above water and protect Long Island's south shore from direct influences of ocean waves and also create and maintain a natural balance among various terrestrial and estuarine habitat types, vegetation cover types, and fish and wildlife species (U.S. Army Corps of Engineers 2016b).

Other than beach nourishment projects, local/state actions that are reasonably certain to occur in the project area that could potentially affect fish and wildlife resources include beach cleaning, the installation of sand fencing, and increase in the amount of recreational activity. The Service requests clarification from the Corps whether easements will be established within the FIMP project area that would preclude local or state entities from conducting such operations to address this cumulative impact.

The installation of snow fencing or the planting of beach grass are common practices in attempting to stabilize nourished beaches and have occurred on other sites on Long Island without federal (Service, Corps) or NYSDEC coordination/authorization. Vegetation planting and snow fence placement, in association with beach nourishment, will artificially accelerate growth of dense vegetation that precludes use of habitat by species which prefer open or sparsely-vegetated beach habitats, including ground-nesting shorebirds and coastal plants. This effect will limit the amount of available suitable habitat for these species and will create suboptimal habitat conditions. Artificially-planted areas that rapidly grow into dense areas of perennial vegetation precludes use by this species. For example, Weakley and Bucher (1992) report that stabilization of seabeach amaranth habitat allows for succession to a densely-vegetated perennial community, rendering the beaches only marginally suitable for seabeach amaranth, which is rarely encountered in areas that have been snow fenced.

Another beach management practice not mentioned in the project description which could occur over the life of the project is beach raking. Beach raking/cleaning does occur throughout the FIMP project area, primarily on bathing beaches. Mechanized beach cleaning adversely affects seabeach amaranth and other coastal plants through the direct crushing of plants and removes the wrack line, an important forage micro-habitat for shorebirds.

Off-road vehicle traffic on ocean beaches severely limit ground-nesting shorebirds and coastal plant habitat suitability through the disturbance of foraging and breeding behaviors, as well as crushing of unfledged chicks and plants. The ORVs can also affect shorebird foraging habitat. Kluft and Ginsberg (2009, p. vi) found that ORVs killed and displaced invertebrates and crushed/decimated wrack, in turn lowering the overall abundance of wrack dwellers. In the intertidal zone, invertebrate abundance is greatest in the top 12 in. (30 cm) of sediment (Carley *et al.*2010, p. 9). Intertidal fauna are burrowing organisms, typically 2 to 4 inches (5 to 10 cm) deep; burrowing may ameliorate direct crushing. However, shear stress of ORVs can penetrate up to 12 inches (30 cm) into the sand (Schlacher and Thompson 2008, p. 580).

Increase in Recreational Activities

Indirect effects of disturbance to ground-nesting shorebirds also occurs by limiting breeding habitat to oceanside habitats that are simultaneously made more attractive for recreational activities by beach stabilization projects. Recreational activities that may potentially adversely affect these species include an increase in beach patrons and associated activities (ORV use, sunbathing, sports, playing loud music, etc.), unleashed pets, fireworks, kite-flying, and increase in garbage and refuse concomitant with increased recreational activities. Unleashed pets, such as dogs and cats, can prey on shorebirds. Kite-flying may disturb these species as it is believed that the ground-nesting shorebirds perceive kites as avian predators.

The level of recreational impacts within potential ground-nesting shorebird areas is expected to increase in the near term. Wide beaches with little human disturbance at the time these species initiate nesting (March to May) often experience heavy recreational pressure later in the nesting season (June through August), potentially creating sufficient disturbance to cause abandonment of nests, interfere with foraging, cause broods to be separated from adults, or attract predators. The degree to which increases in recreational activity and predator habitat result in mortality or disturbances to ground-nesting shorebirds and their chicks depends on the degree to which the protection measures are implemented.

Seabeach amaranth and other coastal plant colonization is unlikely to occur on intensively used recreational beaches, but would be more likely in areas fenced for the protection of piping plovers and other beach nesting birds (U.S. Fish and Wildlife Service 2002).

## IX. MITIGATION/FISH AND WILDLIFE ENHANCEMENT RECOMMENDATIONS

### Service Mitigation Policy

The Service’s Mitigation Policy (Policy) (U.S. Fish and Wildlife Service 1981b) was developed to guide our preparation of recommendations on mitigating the adverse impacts of land and water developments on fish, wildlife, their habitats, and uses thereof. It helps both the Service and the federal action agency, in this case, the Corps, by assuring consistent and effective recommendations, by outlining policy for the levels of habitat mitigation needed, and the various methods for accomplishing mitigation for habitat losses associated with such projects. It allows federal action agencies to anticipate Service recommendations and to assist in the preparation of mitigation measures early, thus avoiding delays and assuring equal consideration of fish and wildlife resources with other project features and purposes (FWCA: 16 USC 661-667[e]).

The term “mitigation” is defined in the Service’s Policy (U.S. Fish and Wildlife Service 1981b) as: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating impacts over time; and (e) compensating for impacts by replacing or providing substitute resources or habitats.

As previously stated, the President’s memorandum entitled, “Mitigating Impacts on Natural Resources From Development and Encouraging Related Private Investment” (Federal Register Vol. 80, No. 215 Friday, November 6, 2015) was very recently issued to federal agencies and sets forth a series of directives that will factor into our FWCA and ESA consultations including, but not limited to:

- “Agencies’ mitigation policies should establish a net benefit goal or, at a minimum, a no net loss goal for natural resources the agency manages that are important, scarce, or sensitive, or wherever doing so is consistent with agency mission and established natural resource objectives. When a resource's value is determined to be irreplaceable, the preferred means of achieving either of these goals is through avoidance, consistent with applicable legal authorities. Agencies should explicitly consider the extent to which the beneficial environmental outcomes that will be achieved are demonstrably new and would not have occurred in the absence of mitigation (*i.e.* additionality) when determining whether those measures adequately address impacts to natural resources;

- Agencies should set measurable performance standards at the project and program level to assess whether mitigation is effective and should clearly identify the party responsible for all aspects of required mitigation measures. Agencies should develop and use appropriate tools to measure, monitor, and evaluate effectiveness of avoidance, minimization, and compensation policies to better understand and explain to the public how they can be improved over time; and

- When evaluating proposed mitigation measures, agencies should consider the extent to which those measures will address anticipated harm over the long term. To that end, agencies should address the durability of compensation measures, financial assurances, and the resilience of the measures' benefits to potential future environmental change, as well as ecological relevance to adversely affected resources."

**Corps Proposed Mitigation Measures/Best Management Practices**

Refer to the Corps' DEIS for a detailed description of the proposed mitigation measures and best management practices (U.S. Army Corps of Engineers 2016a). A summary of these measures are listed as follows:

- The borrow areas are sloped in a manner to prevent anoxic conditions.

- Federal or state-listed wildlife species surveys - all findings will be reported to the Service for potential consultation to modify any procedures to reflect actual observed impacts and associated responses.

- Plant endemic vegetation at low densities (18 in. on center).

- Time-of-Year Restrictions, which will provide for no activities between April 1 and September 1 to protect piping plovers and May 1 to November 1 to protect seabeach amaranth.

- Provisions for the project to only undertake low impact construction activities, such as beach surveying or the installation of sand fencing, during the piping plover breeding season, utilizing a 300-ft protective buffer zone.

- Surveying and monitoring of the action area for threatened and endangered species during the spring and summer nesting seasons. Monitoring will include identification of suitable habitats, nesting areas, symbolic fencing, and signage.

- Intensive protection of breeding piping plovers on all suitable habitats in the action area from human disturbance (e.g., ORVs, and recreational activities) and predator management will be undertaken following the conditions outlined below.

- Suitable habitats within the Project area(s) shall be protected through the placement of symbolic fencing and warning signs.

- All pedestrian and ORV access into, or through, the breeding or growing areas shall be prohibited.

- Beach access sites (*i.e.*, existing pedestrian dune crossings) will be evaluated each spring to determine if such access sites will be closed to pedestrian use (April 1 to July 1, if no birds are present; and from March 15 until the birds fledge, if there are plovers present).

- Productivity and population surveys will be conducted each year. Surveys will be recorded and summarized, and plover locations will be recorded on maps, indicating areas surveyed and habitat types.

- The storage of equipment and materials shall be confined to within the construction site and/or upland areas greater than 100 ft from the tidal wetland boundary (intertidal zone).

- Excavated sediments shall be placed directly into the Project site. All fill shall consist of "clean" sand material, to maintain suitable piping plover and seabeach amaranth habitat.

The Service requests clarification on whether the Corps will enforce landowners/land managers' abidance with these measures.

<u>Service Planning Aid Letter 2005</u>

With Corps funding, the Service prepared a PAL entitled "Identification of Restoration Opportunities within the Fire Island to Montauk Point Reformulation Study Area" published in April of 2005 (Service 2005). Although the site investigations occurred in 2005 and 2004, much of the information and observations are still relevant. This document listed numerous potential restoration projects for fish and wildlife resources/habitats ranging from wetlands, federal and state-listed ground-nesting shorebirds, shellfish, and anadromous fish. The following table summarizes the PAL findings. The Corps could implement projects identified here to rectify/compensate for project impacts.

Table 5. Potential Restoration Projects within the FIMP Study Area

| Site | Location | Approximate Size | Type of Restoration | Ownership | Benefit to T&E Species | Site |
|---|---|---|---|---|---|---|
| *COTE = Common Tern; LETE = Least Tern; PPL = Piping Plvoer; ROTE = Roseate Tern; T&E = Threatened and Endangered Listed Species* | | | | | | |
| Cupsogue County Park | Moriches Inlet | 5 ac. | Clearing of vegetation for plovers and terns | Suffolk County | Yes | Past restoration prior to 2005 was successful |
| Democrat Point | Fire Island Inlet | 25 ac. | Clearing of vegetation for plovers and terns | New York State | Yes | Heavy recreational use |
| Pikes Beach | Moriches Bay, Westhampton | 10 ac. | Clearing of vegetation for plovers and terns | Town of Southampton | Yes | History of PPL nesting |
| Warner's South Island | Shinnecock Bay | 2 ac. | Dredge material placement for terns | Suffolk County | Yes | History of ROTE nesting |
| Shirley Marina | Bellport Bay | 10 ac. | Clearing of vegetation for terns | Suffolk County | Yes | History of LETE nesting |
| John Boyle Island | Bellport Bay | 5 ac. | Clearing of vegetation for terns | Town of Brookhaven | Yes | History of LETE nesting |
| New Made Island | Moriches Bay, West of Moriches Inlet | 3 ac. | Clearing of vegetation for terns | Town of Brookhaven | Yes | History of COTE nesting |
| East Inlet Island | Moriches Inlet | 5 ac. | Removal of dredge spoil for terns | Town of Brookhaven | Yes | History of ROTE nesting |
| Wertheim Refuge | Carmans River | 100 ac. | Removal of Common Reed | Service | No | Also propose to restore hydrology |
| Brown's Creek | Great South Bay, Sayville | 2 ac. | Shoreline stabilization, Spartina plantings | Suffolk County | No | Corps Operations Division project |
| Roosevelt Estate County Park | Sayville | 5 ac. | Common reed control | Suffolk County | No | Local support for view-shed restoration |
| Islip Meadows County Nature Preserve | Great South Bay, East Islip | 25 ac. | Common reed control | Suffolk County | No | Adjacent to Islip Nature Preserve |
| Green's Creek | Great South Bay, West Sayville | 2 ac. | Common reed control | Suffolk County | No | Public support for restoration |

| | | | | | | |
|---|---|---|---|---|---|---|
| Beaver Dam Creek | Bellport Bay | 5 ac. | Common Reed control, removal of dredge spoil | New York State | No | Portion of work complete; Multi-partnerships |
| Seatuck Refuge | Champlin Creek Great South Bay | 5 ac. | Remove dredge spoil and restore hydrology | Service | No | Service/ Refuge |
| Blue-points Bottom-lands | Great South Bay | 11,500 ac. | Shellfish and SAV beds | TNC | No | Multi-partnerships |
| Mud Creek | Moriches Bay | 10 ac. | Alewife fishway | Suffolk County | No | Common reed removal also proposed |
| Swan River | Patchogue Bay | 1 ac. | Alewife fishway | Privately owned | No | Fishway for brook trout, as well |
| Kismet | Great South Bay | 2 ac. | Restore littoral drift | Privately owned/ FIIS | No | Re-alignment of marina |
| Sailor's Haven | Great South Bay | 10 ac. | Restore littoral drift | Privately owned/ FIIS | Possibly, plover foraging habitat | Re-alignment of marina |
| Saltaire | Great South Bay | 5 ac. | Restore littoral drift | Privately owned/FIIS | No | Re-alignment of marina |
| Great Gun | Moriches Bay | 5 ac. | Restore littoral drift | Privately owned/ FIIS | Possibly, plover foraging habitat | Re-alignment of marina |
| Robbins Rest | Great South Bay | 5 ac. | Restore littoral drift | Privately owned/FIIS | Possibly, plover foraging habitat | Re-alignment of hardened shoreline |
| Point of Woods | Great South Bay | 10 ac. | Restore littoral drift | Privately owned/ FIIS | Possibly, plover foraging habitat | Re-alignment of hardened shoreline |
| Cherry Grove | Great South Bay | 5 ac. | Restore littoral drift | Privately owned/ FIIS | Possibly, plover foraging habitat | Re-alignment of hardened shoreline |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fire Island Pines | Great South Bay | 10 ac. | Restore littoral drift | Privately owned/ FIIS | Possibly, plover foraging habitat | Re-alignment of hardened shoreline |
| Abbetts Creek | Patchogue Bay | 5 ac. | Remove dredge spoil and restore hydrology | Town of Brookhaven | No | Adjacent tidal wetlands |
| Moriches Avenue Site | Moriches Bay | 5 ac. | Remove dredge spoil and restore hydrology | Town of Brookhaven | No | Adjacent tidal wetlands |

Service February 13, 2008, Correspondence

The Service provided a list of potential habitat creation, restoration, and/or enhancement in a February 13, 2008, correspondence to the Corps. A summary of each project identified on Fire Island are listed as follows:

- Democrat Point/RMSP: Clear dense vegetation to restore early successional habitat (308 ac.);
- Lighthouse Beach: Create bayside overwash habitat (58 ac.);
- Robin's Rest: Create bayside overwash habitat (27 ac.);
- Sailor's Haven: Create bayside overwash habitat (24 ac.);
- Carrington Tract: Create bayside overwash habitat (12 ac.);
- John Boyle Island: Restore tern habitat (5 ac., also identified in the PAL);
- Talisman: Create bayside overwash habitat (acreage not provided);
- Blue Point Beach Tract: Create bayside overwash habitat (acreage not provided);
- FIIS Wilderness Area: Create bayside overwash habitat (20 ac.);
- West and East Inlet Islands: Restore plover and tern habitat (32 ac.).

These above-described projects are examples or options of potential compensatory measures designed to mitigate for the FIMP impacts to fish and wildlife resources. As further described below, the Service notes that the total amount of mitigation required for this project is yet to be determined, subject to a better understanding of the project impacts.

All of the Service-recommended restoration/enhancement/creation projects combine for a total of 12, 436 ac., 11,500 of which consists of the Blue Points Bottom shellfish area. All remaining projects add up to 936 ac., of which 600 involve creating/restoring bayside overwash habitat.

**Recommended Compensatory Mitigative Measures**

The Corps has determined that the FIMP TSP would prevent the creation of 1,536 ac. of back bay habitat (which would presumably include 377 ac. above MSL). As stated above, the Service recognizes that this estimate could be less since there is also the potential that: 1) a breach would not form in each of these locations over the 50-year life of this project and; 2) should breaches occur, they could close naturally or reach equilibrium at any time prior to 12 months. Conversely, this total could be conservative in that: it would not include overwash habitat that could also be created across the existing barrier island in the event of severe storms; the potential for breaches to provide additional sediment beyond 12 months if it hasn't reached equilibrium or closed; and the potential for higher sea level rise which could result in more breaching and more sediment deposition in the backbay. When looking only at the amount of back bay habitat that the FIMP would prevent from forming from breaches, the creation/restoration/enhancement of a minimum of 1,536 ac. of early successional/overwash habitat would be appropriate to compensate for the impacts of the FIMP TSP. However, as stated above, the amount of overwash that the FIMP will prevent from forming also needs to be accounted for. Additionally, sea level rise needs to be accounted for in assessing the amount habitat that would be available over the 50-year life of the project as well as the salt marshes' ability to keep pace with seas level rise. The creation of sand flats that provide platforms for new salt marsh growth would provide protection to wetland and upland areas from sea level rise (U.S. Army Corps of Engineers 2016a). As stated in Section III-D above, further coordination/assessment with DOI is needed regarding the sea-level rise rates used in the majority of the Corps' documents.

As such, the Service requests additional information on the amount of overwash habitat that the FIMP would prevent from forming over the life of the project. Additionally, information on how the compensatory measures will perform in the future with the latest/scientifically correct and agreed-upon sea-level rise rates are needed before we can recommend a total amount of compensatory mitigation.

The Service recognizes the challenge in securing suitable areas for restoration/enhancement/creation and receiving approvals/buy in from landowners and land managers and is available to assist and coordinate with the Corps in this regard.

The below described additional measures could also be implemented which may reduce the amount of mitigation required.

**Additional Measures**

Best Management Practices During Construction and Post-Construction Between Nourishment Cycles

- Preconstruction surveys of the borrow areas to ensure that impacts to highly diverse areas containing substantial surf clam populations are avoided or minimized;

- Benthic infauna in borrow areas are likely to recolonize more rapidly if small "islands" are left in the borrow areas (Minerals Management Service 2000, Rice 2009). Recommend leaving as many untouched "islands" in the borrow area as possible.

- As described above in the impacts section and the revised project design discussion below, vegetation planting and sand fencing limits habitat suitability for beach strand-dependent species (piping plover, seabeach amaranth, least tern, etc.). As such, the location and scale of these practices should be minimized to the greatest extent practicable. When stabilization is required, vegetation alone should be used on dunes to trap windblown sediment so that resulting dunes are more natural in size, shape and location (Nordstrom *et al.* 2012). The use of snow/sand fencing should be minimized as much as possible (Rice 2009).

- To facilitate benthic invertebrate recovery (Rice 2009):

    - Beach fill material must be compatible, being similar in color and grain size distribution, with the native sediment on the existing beach;
    - Be placed to the thinnest depth possible;
    - Fill should not be placed in contiguous sections of beach but should be divided into shorter sections;

- Beaches should not be raked or mechanically cleaned, wrack materials should be preserved.

Revise Project Design

- Lower proposed dune heights to promote overwash and early successional habitat in appropriate areas. Maslo *et al.* (2011) conclude that recovery and persistence of piping plovers and other early successional habitat-dependent species will depend on conservation and restoration of breeding habitats with very low slopes, dune heights, vegetative cover, and wide, flat beaches in order to ensure that plovers and their chicks are able to move freely from their nesting sites/dry areas to foraging areas within the intertidal area as well providing suitable nesting habitat. Specifically, Maslo *et al.* (2011) recommended dune thresholds for suitable plover breeding habitat of 1.6 m. (5.25 ft) dune height (from apex to the seaward toe), dune slope of 17 percent, shell/pebble cover of 17-18 percent and 22 percent vegetative cover. The more-gradual slope of the dune will likely allow for plover brood movements between the dune/back dune and intertidal areas. Additionally, the use of compatible sand and maintaining sparsely-vegetated dunes/upper beach will promote plover/tern/black skimmer/American oystercatcher breeding. Specifications on dune heights, locations, etc. can be agreed upon during the ESA consultation.

*Supplement Shinnecock Bay SAV/Shellfish Restoration Efforts*

The above described Shinnecock Bay Restoration Program is conducting an on-going effort to restore eelgrass beds in Shinnecock Bay and is planning to install clam sanctuaries in the Bay, as well. The Corps could assist in this endeavor through providing funds or labor/resources.

*Colonial Shorebird Breeding Habitat Restoration*

There are numerous sites within the FIMP that have a history of colonial shorebird breeding, including the black skimmer, which no longer nest in these historic nesting sites within the study area. The Service is in the process of refining and further developing more specific information/recommendations and invites the Corps to coordinate with the Service in this regard.

*Stormwater Treatment*

The Corps should explore opportunities to partner with local municipalities and state agencies to improve bay water quality through improved storm-water treatment. The Service is in the process of refining and further developing more specific information/recommendations and invites the Corps to coordinate with the Service in this regard.

**Corps-Proposed Mitigation/Coastal Process Features**

In regards to the coastal process features that are proposed for restoration, the GRR lists coastal process features at seven locations (GRR at page xii) while the DEIS lists eleven (DEIS page 2-27) (only 10 of which are viable since restoration at the Seatuck National Wildlife Refuge has already been completed). Coastal Processes restoration at John Boyle, New Made, and Warners Islands, and the Atlantique to Corneille portion of Fire Island, listed in the DEIS are not included in the GRR.

The GRR identifies coastal process features at seven locations which are described as follows:

- *Sunken Forest* – Reestablishes coastal protective features by reestablishing the natural conditions of dune, upper beach, and bay shoreline by removing bulkhead adjacent to marina and existing boardwalk, regrading and stabilizing disturbed areas using bioengineering and shoreline.

- *Reagan Property* – Reestablishes coastal protective features by improving natural conditions of dune, upper beach, and shoreline by burying bulkhead, regrading and stabilizing disturbed areas using bioengineering, and creating intertidal areas.

- *Great Gunn* – Reestablishes saltmarsh features by reestablishing hydrologic connections and disturbances.

- *Tiana* – Reestablishes the bay shoreline natural protective features by reestablishing the dune, saltmarsh, and enhancing the SAV beds.

- *WOSI* – Reestablishes the bay shoreline natural protective features by reestablishing the existing saltmarsh.

- *Islip Meadows* – Reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connections.

- *Seatuck Refuge* – Reestablishing saltmarsh habitat in conjunction with nonstructural measures by restoring hydrologic connection and plantings.

The additional four CPF's proposed in the DEIS are described as follows:

- *John Boyle Island* – Create shorebird nesting habitat by regrading/removing vegetation on existing dunegrass areas to promote use of the areas by breeding/nesting shorebirds, and using herbicide to control Phragmites. Use bio-engineering measures to stabilize approximately 1,500 ft of eroding island shoreline.

- *New Made Island* – Convert existing Phragmites-dominated intertidal areas to habitat suitable for shorebird breeding and nesting.

- *Atlantique to Corneille* – Create new saltmarsh by excavating and regrading upland areas and bay shoreline, and planting native saltmarsh species.

- Warner Island East – Create additional dunegrass habitat.

The Service has supported the development of alternatives that restore natural processes and provide crucial sources of habitat for species which require early-successional habitats within the coastal beach ecosystem (see U.S DOI correspondence dated June 3, 2008). We have also expressed support for restoration of bay islands for colonial waterbird species, submerged aquatic vegetation, and saltmarsh wetlands, which support birds of conservation concern and we highlighted the importance and our support of research into methods for habitat restoration in this type of coastal setting, and urged the Corps to build pilot projects as soon as possible in the U.S DOI June 3, 2008, correspondence.

The Corps-proposed features were developed, generated and assessed using a Habitat Evaluation Procedures (HEP) analysis. In 2004, the Corps formed the interagency FIMP Habitat Evaluation Procedures (HEP) Interagency Team, consisting of the Corps, Service, NPS, NYSDEC, and Rutgers University (consultant to the NPS). This team, which met on numerous occasions from 2004-2007, developed a number of goals and alternatives for habitat restoration, including the following:

"1. Maximize the benefits, functions, and biodiversity of natural and native habitats on FIMP;

2. Advance the status of populations of rare, threatened, and endangered biota on FIMP;

3. Re-establish natural rates of longshore sediment transport along the ocean and the bay;

4. Improve circulation into and within the back bay; and

5. Re-establish natural rates of cross-island sediment transport" (U.S. Army Corps of Engineers 2006a.)

The Service continues to support these goals, however, we continue to express our concern (See U.S. Fish and Wildlife Service's HEP letter of July 7, 2006, and the November 17-19, 2004, HEP team meeting minutes [U.S. Army Corps of Engineers 2009b]), that the Corps' HEP/CPF features have failed to address, goals 2 and 5, above. The following is a summary of the Service's concerns with the FIMP HEP analysis:

- None of the Corps proposed HEP restoration/CPF's are designed to facilitate cross-island sediment transport.

- The HEP analysis was only used to quantify benefits of the CPF's and was not used to quantify project impacts.

- The HEP analysis assumes that restoration projects will be maintained without any landowner buy-in.

- The HEP model was designed to increase Habitat Suitability Index (HSI) values when: beach nourishment prevents natural processes (overwash/breaching) from occurring; stabilizes dynamic habitats created by overwash; and larger dunes are constructed when compared to smaller dunes.

- The HEP model was designed to decrease HSI values when natural processes occur.

Concerns with the HEP analysis aside, the Service supports many of the CPF alternatives proposed, in fact, three of these alternatives (Islip Meadows, John Boyle Island, and New Made Island) were recommended by the Service in our 2005 PAL and/or February 13, 2008, correspondence. Specifically, the Service supports alternatives which are designed to:

- Restore tidal marsh through the removal of non-native invasive vegetation and restoring/improving hydrological connections and tidal pools;

- Stabilize eroding bay shoreline through the use of bio-engineering techniques (provided it does not adversely affect shorebird/federally-listed species foraging) and the removal of bulkheads;

- Enhance SAV habitat;

- Create/restore shorebird breeding habitat by allowing or mimicking natural processes;

- Remove manmade structures such as boardwalks, walkways, sand fencing, and parking lots.

However, while the Service supports many of the proposed CPF and these alternatives partially address some of the FIMP project impacts (limiting SAV bed development and stabilization/dense vegetation growth limiting colonial shorebird breeding habitat) on a small scale, these alternatives do not address/ameliorate/mitigate for the majority of the above-described FIMP project impacts. As the Service expressed during HEP team meeting minutes and in our July 7, 2006, correspondence, there are no alternatives designed to facilitate cross island sediment transport. Additionally, the Service does not support the CPF's designed to further stabilize or enhance dunes, which would further stabilize the upper beach/dunes and swale habitats, promote dense vegetation growth and exacerbate the FIMP project impacts. Apart from the small-scale restoration of wetlands targeted for the mainland, there does not appear to be any substantial, landscape-level evaluation of wetland restoration opportunities for mainland marshes to address shoreline protection and flood abatement.

While the Corps identifies Cross Island Sediment Transport as a vital coastal process (EIS - pp 2-26) and "fundamental to the long-term geologic resiliency of barrier islands" (GRR - page 12), it also identifies a project impact of less sediment input in the bays and decreasing long-term formation of saltmarsh and submerged aquatic vegetation (EIS page ES-4). And though these impacts have been identified, the GRR/EIS provide no mitigation/coastal process features to address this significant impact in a scale commensurate with the impacts of beach construction over 19 mi. and breach filling over 40 mi. of barrier island habitat.

In terms of coastal processes, it is not clear which coastal processes the Corps is restoring in the habitat restoration of man-made dredge spoil islands. Restoration of these islands for purposes of waterbird breeding habitat may be warranted with other goals in mind. Consequently, the U.S. Fish and Wildlife Service does not support these projects as materially offsetting impacts of this project or significantly restoring coastal processes. To that end, the Service re-iterates the need for a comprehensive analysis of the with and without project habitat changes/impacts so we can determine the right portfolio of mitigation in terms of type, quantity, quality, and position on the landscape.

Whether or not mitigation for breaches will be implemented is still unclear in the GRR/DEIS. For example, the GRR (Appendix K, page 17, third paragraph) states (emphasis added), "Placement of additional sand material in the bay during the hydraulic construction closure of the breach could be included in the condition breach closure, to emulate flood shoal volumes of breaches allowed to remain open." However, the DEIS, on pp 261 and 396, states, "To minimize impacts to the species [piping plover] and habitat efforts would be made to artificially create and maintain high quality piping plover habitats, minimize direct disturbance to piping plover breeding on stabilized beaches, and reduce project induced effects of increased recreational disturbance." Under the red knot section (pp 261 and 397), the DEIS states, "To minimize impacts to the species and habitat, efforts would be made to artificially create and maintain high quality red knot habitats and reduce project induced effects of increased recreational disturbance."

Further, Appendix K of the GRR indicates that there is some speculation about how these CPF's would be maintained into the future (for the life of the project), suggesting it would require funding by separate Corps authorization or by the local cost-share sponsor. Per the above-described Presidential memorandum on mitigation, prospective funding and responsibility for project impact mitigation is not appropriate, but should instead be captured in the DEIS/GRR. The CPF's are not linked by form, function, quality, or quantity to project impacts. There is no indication that any of the projects are viable from the standpoint of landowner agreement or that necessary permits would be granted for such actions. Further, there is no information as to performance criteria and who would be responsible for maintaining the mitigation or funding any maintenance activities for the life of the project. It is therefore, unclear if the regulatory agencies, such as the NYSDEC, agree with these restoration projects and whether or not they remain viable. As noted above, this concurrence would not relieve the Corps of addressing the concerns of the Service on the overall approach and methodologies which were employed in the selection of these projects.

**Adaptive Management**

The Corps described their proposed adaptive management program in their GRR as follows:

- Will provide for monitoring for project success, relative to the original objectives and the ability to adjust specific project features to improve effectiveness.

- Climate change will be accounted for with the monitoring of climate change parameters, identification of the effect of climate change on the project design, and identification of adaptation measures that are necessary to accommodate climate changes as it relates to all the project elements.

The Service requests more information on what parameters will be specifically measured, what thresholds will be established to assess project success and what potential corrective measures will be implemented to attain this success.

**Open Marsh Water/Integrated Management**

The NPS determined that nearly all backbarrier marshes on Fire Island have been ditched for mosquito control (National Park Service 2009). A potential measure to improve habitat diversity could be to practice open-marsh water/integrated management which includes the filling in ditches and creating new tidal creeks and ponds, which allow small fish and other mosquito predators back into the marsh (U.S. Fish and Wildlife Service’s website: http://www.fws.gov/refuge/Wertheim/wildlife_and_habitat/index.html).

**Bayside Shoreline Processes**

The NPS’s FIIS has identified areas within the National Seashore’s jurisdiction, where the littoral drift is being interrupted by hard structures (bulkheads, revetments, marinas, etc.) and adjacent non-hardened areas are being eroded. Through coordination with the Service during our efforts in identifying restoration projects for the PAL in 2005 (U.S. Fish and Wildlife Service 2005), eight specific areas having the potential for restoration of bayside shoreline processes. Four areas are eroded due to adjacent marinas, including Sailor’s Haven, Great Gun, Kismet, and Saltaire. Additionally, four areas are eroded due to adjacent hardened shorelines, including east of Fire Island Pines, east of Point of Woods, east and west of Cherry Grove, and east and west of Robbins Rest. For each of these sites, restoration would involve the redesigning/realignment of these hard structures to restore littoral drift. These sites are listed in the PAL and in the above summary table.

**Study/Survey Needs**

The NPS identified data/study needs for the FIIS in their Assessment of Natural Resource Conditions Report (National Park Service 2009). The studies relevant to the FIMP and it’s impact on fish and wildlife resources (with Service emphasis in parenthesis) are listed as follows:

- The retreat of bayside shoreline should be monitored closely, and management actions to mitigate the effects of existing and proposed bulkheads (and the limiting of sediment transport to the bay) should be considered.

- A detailed analysis of recent nutrient monitoring data is warranted to determine if ambient nutrient concentrations are increasing. Seasonal monitoring of nutrients and DO in coastal embayments surrounding Great South Bay would identify problem areas requiring remediation, hopefully before nutrient loading in these areas has a negative impact on Great South Bay and FIIS. Similarly, only limited monitoring of groundwater nutrient levels has been conducted recently. It is recommended that a more extensive monitoring effort be implemented to determine the spatial extent and depth of nitrogen contamination, both within the groundwater system and within shallow bay habitats. These measurements should be continued with particular emphasis on monitoring during time periods of maximal drawdown during the summer. Monitoring of fecal and total coliforms or other suitable markers of sewage bacterial contamination should be expanded in Great South Bay and Moriches Bay, particularly in the waters near FIIS, to ensure that this potential risk to human health is adequately assessed and support management plans enacted to reduce impacts. (To address impacts to water quality from limiting breaching)

- There are almost no data on levels of non-nutrient contaminants in Great South Bay and Moriches Bay in general and FIIS in particular. Analysis of contaminants in indigenous filter feeding organisms, such as that underway in NOAA's Mussel Watch program, at several year intervals at some sites within or near FIIS waters, would be a way to address this issue. Such a program would provide a measure of bioavailable contaminants within the waters of the park. (To address impacts to water quality from limiting breaching)

- Conduct an assessment of shellfish populations within its bayside boundary to better assess this resource. Determining the sustainable harvest rate of these populations might help regenerate shellfish populations baywide and provide a form of biological control on brown tide. Efforts to restore shellfish and eelgrass communities in Great South Bay being conducted by TNC and the NYDOS should be closely followed. Data generated from these efforts should be considered in future management plans. (To address impacts to water quality from limiting breaching and associated impacts to shellfish populations)

- Continue to monitor the introduction and spread of invasive plants into the various habitats on Fire Island. In particular, the spread of phragmites into the upper fringes of saltmarshes and brackish habitats should be closely monitored. Management plans should include actions that would help eradicate or prevent the spread of this species. (To address potential of FIMP stabilizing upland habitats and associated increase in invasive species)

- Monitor visitor recreational use of the natural habitats, especially beaches, dunes, and maritime forests. Off-trail trampling of vegetation may increase erosion, spread invasive species, and disturb ground-nesting birds. This threat can be minimized via adequate trail signage and appropriately placed string fencing. (To address potential of FIMP increasing recreational activities)

The Service also suggests the funding and implementing of studies to assess the impacts of Hurricane Sandy on fish and wildlife resources within Great South Bay and Bellport Bay through surveys of benthic organisms, SAV beds, bay water quality, and finfish and tidal marshes, for comparison to pre-storm conditions.

**Cornell Cooperative Extension of Suffolk County Marine Program Recommended Studies**

1) Help support the migratory shorebird foraging and horseshoe crab spawning surveys monitoring network so that it can include some monitoring at Fire Island (backbays). This should include Indices of spawning activities and conventional tagging

2) Use radio telemetry tagging study on Fire Island to help identify key spawning areas for horseshoe crab.

3) Since FINS also extends jurisdiction into the bay, consider using acoustic tagging to assess sub-tidal habitat use during spawning and outside of spawning season. (Some of this work was done by NPS with URI, but spatial coverage can probably be bolstered to identify subtidal habitat use).

4) Replicate the migratory shorebird monitoring survey completed for Moriches Bay in Shinnecock and Great South Bay. This is particularly important given the relationship between horseshoe crab and red knot (threatened species).

## X. SERVICE POSITION

Section 2(b) of the FWCA requires that the final report of the Secretary of the Interior: 1) determine the magnitude of the impacts of the proposed projects on fish and wildlife resources; and 2) make specific recommendations as to measures that should be taken to conserve those resources. The Service has reviewed the current literature on the biological and physical processes affecting the barrier island and coastal ecosystems. Although system specific data are limited, it is clear that when the project is considered within the context of the existing and foreseeable coastal projects, this project has the potential to have significant adverse ecological impacts to fish and wildlife resources of national significance.

In the short-term, the Corps' recommended plan will have direct and indirect adverse impacts on fish and wildlife resources and their supporting ecosystems. Initial beach fill will directly impact subaerial, nearshore intertidal, and subtidal marine habitats, and subaqueous borrow areas. These impacts include burial of benthic organisms, turbidity, and modification of habitats.

In the long-term, the beach fill/dune construction plan will have cumulative impacts extending after the nourishment project, causing adverse impacts on fish and wildlife habitat and the overall condition of the barrier island through reduction in the frequency of coastal processes which maintain the barrier islands as natural protective features. Coastal processes keep the barrier island above water and protect Long Island's south shore from direct influences of ocean waves and also create and maintain a natural balance among various terrestrial and estuarine habitat types, vegetation cover types, and fish and wildlife species.

In the course of its review, the Service has determined that this beach fill/dune construction project could have significant ecological impacts upon the barrier islands, backbays, and their fish and wildlife communities. While the Corps identifies Cross Island Sediment Transport as a vital coastal process and "fundamental to the long-term geologic resiliency of barrier islands" (GRR page 12 - U.S. Army Corps of Engineers 2016b), it also identifies a project impact of less sediment input in the bays and decreasing long-term formation of salt marsh and submerged aquatic vegetation (EIS page ES-4 - U.S. Army Corps of Engineers 2016a). And though these impacts have been identified, the GRR/EIS provide no mitigation/coastal process features to address this significant impact in a scale commensurate with the impacts of beach construction over 19 mi. and breach filling over 40 mi. of barrier island habitat. As such, the Service does not support the TSP as currently proposed.

The Service has identified the impacts that the FIMP could potentially have on fish and wildlife resources and provided recommended measures to avoid, minimize, rectify, reduce and compensate for these impacts. However, the Service requires additional information regarding the project design and expected project impacts before we can recommend a total amount of compensatory mitigation that would result in a no net loss to fish and wildlife resources. A summary of the additional information requested is listed as follows:

- Adaptive management;
- Proposed beach-fill volumes;
- Non-structural measures and associated impact analysis;
- Proposed borrow areas after initial construction;
- Clarification on what conservation/mitigative measures are proposed;
- The design level of the TSP as presently proposed in the GRR/EIS.
- the amount of overwash habitat that the FIMP would prevent from forming over the life of the project;
- Use mid and high sea level rise rates in the impact analysis and assess how the compensatory measures will perform in the future with these latest/scientifically correct and agreed-upon sea-level rise rates;
- Clarification on whether the Corps will enforce landowners/land managers' abidance with Corps-proposed BMP's/mitigative measures
- Clarification from the Corps whether easements will be established within the FIMP project area that would preclude local or state entities from conducting beach cleaning, sand fence installation and recreational activities to address their cumulative impacts.

The Service looks forward to working with the Corps in gathering this information and completing our analysis of this project.

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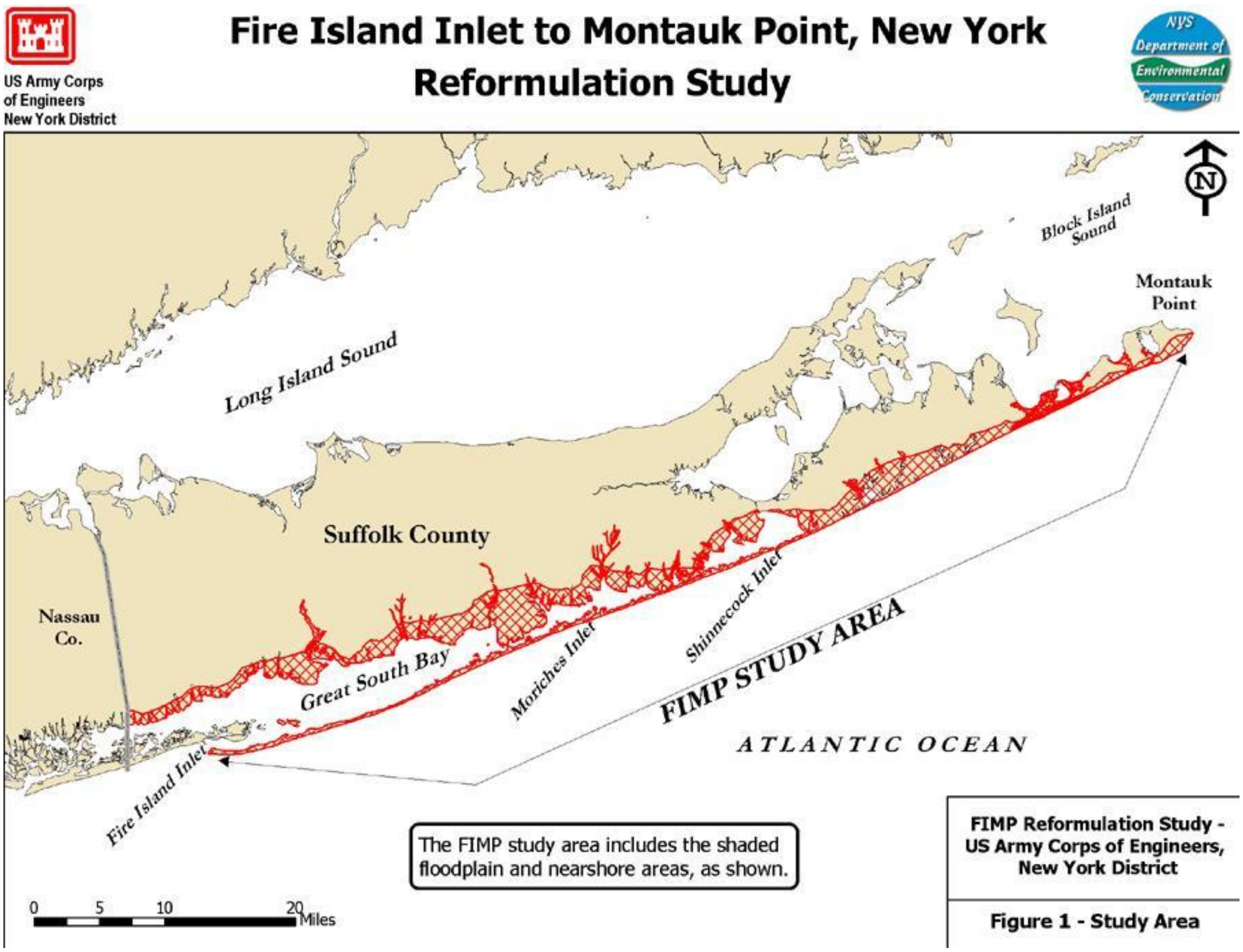
**FIGURE 1**

**FIMP STUDY AREA**




**From U.S. Army Corps of Engineers' Website:**
**http://www.nan.usace.army.mil/Missions/CivilWorks/ProjectsinNewYork/FireIsland toMontaukPointReformulationStudy/FIMPStudyArea.aspx**

## FIGURE 2

## FIMI Study Area

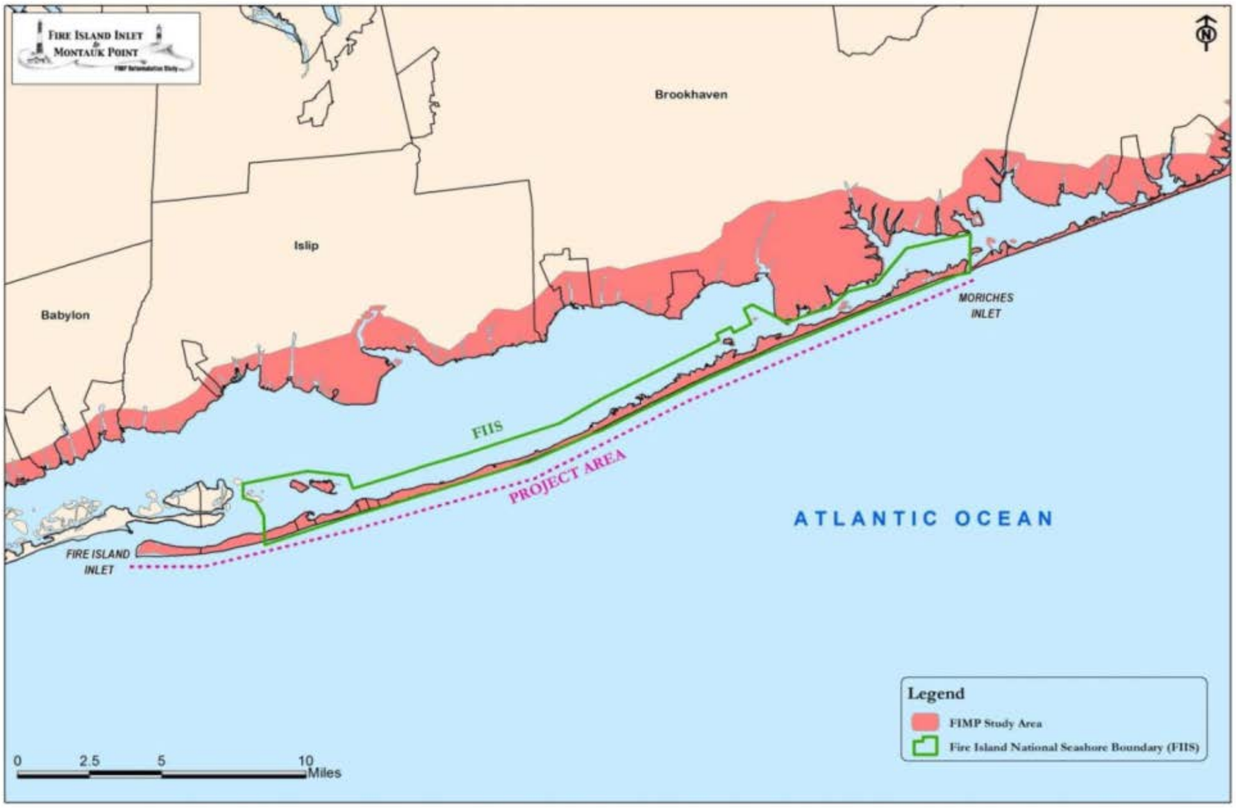



Figure 2. Map of FIMI Project Area. From U.S. Army Corps of Engineers (2014b).

**FIGURE 3**

**Idealized Transect of Barrier Island Ecosytems**

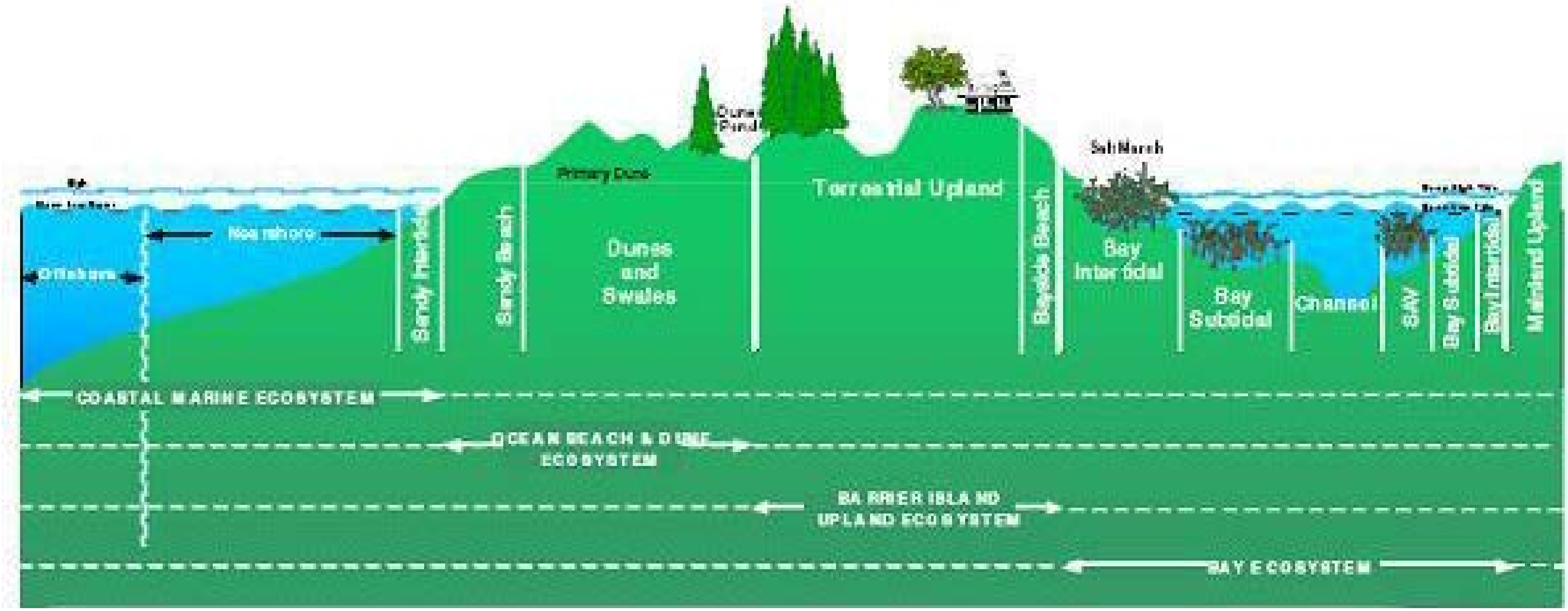



Figure 3. - Idealized Transect of Barrier Island Ecosystems.

(Illustration from: U.S. Army Corps of Engineers. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York Reformulation Study, Work Order 38, Phase 3 Development of the Conceptual Ecosystem Model for the Fire Island Inlet to Montauk Point Study Area. Final Report. )

**APPENDIX A**

Fire Island to Montauk Point Service Back-Bay Island Investigations

| Island | History of Dredge Placement | Cover-type | Location | Wildlife Use | Ownership | Prior Designations | Notes | Restoration Potential |
|---|---|---|---|---|---|---|---|---|
| Sexton Isl. | No | Spartina marsh | Great South Bay | 2003* - COTE, ROTE | NPS | | Site visited 7/14/03 | None |
| Islip Spoil Isl. | Yes | Scrub shrub & grassland | Great South Bay | 2003* - GREG, SNEG, TRHE, GLIB, BLHE | Town of Islip | | Heron Rookery; visited on 7/14/03 | Minimal |
| John Boyle Isl. | Yes | Phragmites/ beachgrass/ spartina | Bellport Bay | Historic – AMOY, BLSK, LETE | Town of Brookhaven | SSLIEI & NYSDOS | NPS jurisdiction, may need NEPA document prep.; visited on 9/01/04 | In phragmites areas at southern portion |
| Hospital Isl. | No | Spartina marsh | Bellport Bay | No records of shorebird breeding | Town of Brookhaven | | Visited on 10/07/03 | None |
| Pelican Isl. | No | Spartina marsh | Bellport Bay | No records of shorebird breeding | Town of Brookhaven | Identified by SSLIEI | Visited on 10/7/03 | None |
| Ridge Isl. | No | Spartina marsh | Bellport Bay | Historic - COTE | Town of Brookhaven | Identified by SSLIEI | Visited on 10/07/03 | None |
| Goose Point Isl. | No | Spartina marsh | Bellport Bay | No records of shorebird breeding | Town of Brookhaven | | Visited on 10/07/03 | None |
| Pattersquash Isl. | No | Spartina marsh | Moriches Bay | 2003 - COTE | Town of Brookhaven | Identified by SSLIEI | Visited on 9/01/04 | None |
| Carter's Island | No | Spartina marsh | Moriches Bay | 2003 – COTE; Historic – LETE, BLSK | Town of Brookhaven | | Visited on 2/26/02 | None |
| New Made Isl. | Yes | Phragmites | Moriches Bay | Historic – COTE, BLSK | Town of Brookhaven | | Within NPS jurisdiction; visited on 9/1/04 | High |
| West Inlet Isl. | Yes | Phragmites, beachgrass, spartina marsh | Moriches Bay | 2003 - COTE and AMOY; Historic - BLSK, GLIB, SNEG, GREG | Town of Brookhaven | Identified by SSLIEI | Phragmites only along shoreline; visited on 9/01/04 | Limited |
| East Inlet Isl. | Yes | Open sand, beachgrass, spartina marsh | Moriches Inlet | Historic - ROTE, COTE, BLSK | Town of Brookhaven | Identified by SSLIEI | Beneficial use of dredge material project completed in 2004; visited on 9/1/04 | Moderate |
| | | Spartina marsh | Moriches | 2003 – COTE, AMOY | Town of | | Visited on 9/1/04 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Swan Isl. | No | | Bay | | Brookhaven | | | None |
| Sedge Spoil Isl. | Yes | Spartina marsh | Shinnecock Bay | Information not available | Town of Southampton | | Visited on 3/12/03 | Limited |
| Sedge Isl. | No | Spartina marsh | Shinnecock Bay | 2003 - COTE | Town of Southampton | | Visited on 3/12/03 | None |
| Tiana Marsh | No | Spartina marsh | Shinnecock Bay | Information not available | Town of Southampton | | Visited on 3/12/03 | None |
| Lesser Greenbacks Isl. | No | Spartina marsh | Shinnecock Bay | Historic – COTE, AMOY | Town of Southampton | | Visited on 3/12/03 | None |
| Lanes Isl. | No | Spartina marsh | Shinnecock Bay | 2003 - COTE, FOTE, ROTE, BLSK, AMOY | Town of Southampton | | Visited on 3/12/03 | None |
| Ponquogue Spoil Isl. | Yes | Shrubs, beachgrass, phragmites | Shinnecock Bay | Historic - AMOY, GLIB, LIHE, RHE, BLHE, SNEG, GREG | Town of Southampton | | Visited on 3/12/03 | Limited, existing heron rookery |

2003* – Observed by the Service during the 2003 breeding season.
2003 – NYSDEC/Long Island Colonial Waterbird and Piping Plover (LICWPPS) data for the 2003 season.

Historic – NYSDEC/LICWPPS data, 1994-2002 breeding seasons.

Shorebird Abbreviations:

COTE–Common tern (*Sterna hirundo*)
LETE–Least tern (*Sterna antillarum*)
BLHE–Black-crowned night-heron (*Nycticorax nycticorax*)
GRHE–Green heron (*Butorides striatus*)
GREG–Great egret (*Casmerodius albus*)
AMOY–American oystercatcher (*Haematopus palliates*)
ROTE–Roseate tern (*Sterns dougallii*)
GLIB–Glossy ibis (*Plegadis falcinellus*)
LIHE–Little blue heron (*Florida caerulea*)
TRHE–Tri-colored heron (*Hydranassa tricolor*)
SNEG–Snowy egret (*Egretta thula*)
BLSK–Black skimmer (*Rynchops niger*)

Other Abbreviations:

Isl. – Island
NYSDOS - New York State Department of State
SSLIEI - South Shore Long Island Embayments Initiative.