Reformulation of the Shore Protection and Storm Damage Reduction Project
South Shore of Long Island, New York - Fire Island Inlet to Montauk Point

FINAL AVIAN SURVEY SUMMARY REPORT
MAY 2002 – MAY 2003

OCTOBER 2003

Prepared by: **U.S. Army Corps of Engineers**
Planning Division
New York District
26 Federal Plaza
New York, New York 10278-0090

FINAL AVIAN FIELD SAMPLING SUMMARY REPORT

MAY 2002 – MAY 2003

FOR THE

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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

The U.S. Army Corps of Engineers (USACE), New York District, is conducting a comprehensive feasibility-level reformulation of the Shore Protection and Storm Damage Reduction Project (Project) for the south shore of Long Island, New York, from Fire Island Inlet to Montauk Point. The Federally authorized Project area extends west from Montauk Point to Fire Island Inlet along the Atlantic Coast of Suffolk County, Long Island, New York (Figure 1). The Project was initiated in response to continued threat of significant economic losses and damages to commercial, residential, public, and other infrastructure in the Project area as a result of severe storms. The principal problems are associated with extreme tides and waves that can cause extensive flooding and erosion both within barrier island and mainland communities. The threat of continued breaching and inundation of the barrier islands along the south shore of Long Island poses a significant threat of flooding and economic losses, especially to the mainland communities bordering Shinnecock, Moriches, and Great South bays.

The USACE is undertaking a process of plan formulation to evaluate the range of possible alternatives to address these problems, including a screening of alternatives, detailed design, design optimization, and final design. Concurrent with the development of plans, site-specific information on aquatic and terrestrial communities has been collected to assist in the evaluation these Project alternatives in order to identify the recommended plan of protection.

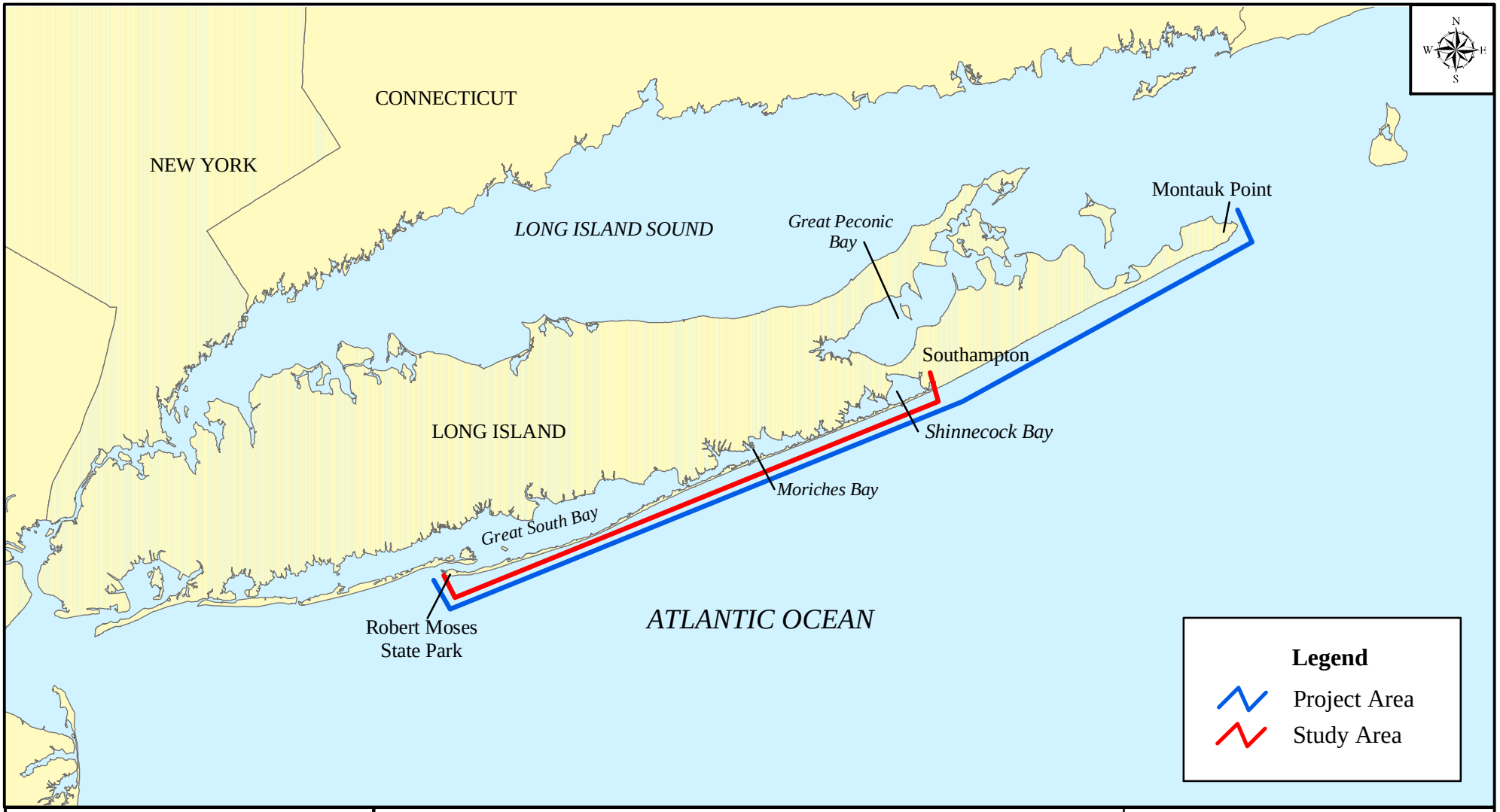
The USFWS conducted a study of fish and wildlife resources in 1982 for the USACE's Fire Island Inlet to Montauk Point, New York, Beach Erosion Control and Hurricane Protection Project Reformulation Study (USFWS 1983). Although the USFWS report presents information on bird use of habitats on the south shore barrier island, there is a need for more current detailed habitat information, and information on the seasonal usage of the island by bird species.

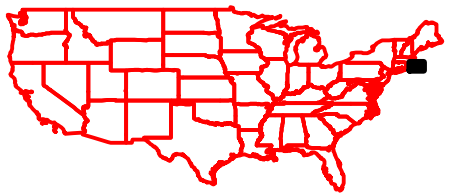
This report presents a summary of results from a 1-year study to document avian (i.e., bird) species occurrence on the barrier island. The focus of avian sampling was to collect information on seasonal bird use of the barrier island within the proposed Project area. The USACE barrier island Avian Study (Study) was conducted from May 2002 through May 2003 over approximately 52 miles of the barrier island located along the south shore of the Great South Bay, Moriches Bay, and Shinnecock Bay. The Study area extended west from Southhampton, New York, to the western-most point of Robert Moses State Park, New York (Figure 1). The purpose of this study was to inventory bird usage of the island in order to develop a comprehensive list of species using the island and to relate species use to habitats, especially those that could potentially be impacted under a no-action scenario or various flood protection alternatives proposed for the Project. This report presents a summary of the 1-year avian Study and includes the following: Study area description (Section 2.0), methodology (Section 3.0), results (Section 4.0), discussion (Section 5.0), implications for plan formulation (Section 6.0), and literature cited (Section 7.0). Photographic documentation is included in

Appendix A, field notes are in Appendix B, a species list is in Appendix C, and a printout of the database is provided in Appendix D.

1.2 OBJECTIVES

The primary objective of the Study was to develop a list of avian species observed utilizing the predominant community types (e.g., habitats) found within the Fire Island Study area during migration, breeding, and wintering periods. A secondary objective was to conduct survey activities over a wide range of weather and time-of-day conditions over the course of the 1-year study, to account for the variation in activity patterns that occurs among the different species under different tidal and seasonal conditions.





Project Location

0 10 20 40

Scale in Miles

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999

Figure 1. Location of the Fire Island Shore Protection and Storm Damage Reduction Project and Avian Study Area.

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Date: 10/03

Prepared By: NEA

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2.0 DESCRIPTION OF STUDY AREA

Typical of most barrier islands, the south shore barrier island is a narrow, low-lying landform consisting of beaches, sand dunes, saltwater marshes, herbs, shrubs, stunted forests, and tidal flats. The barrier island parallels the ocean coast of Long Island and is generally separated from the mainland by bays. The barrier beach is a dynamic landform, constantly moving and reshaping in response to storms, sea level changes, and wave action. Barrier islands serve as buffers against storms and wave action for the coastal mainland and shelter productive wetland habitats and provide essential nesting and feeding areas for many aquatic and terrestrial plants and animals, including rare species.

Located within the Study area is Fire Island, a 32-mile stretch of barrier island. In 1964, Congress declared 26 miles of the island and surrounding waters to be a part of the National Park System. A 7-mile stretch, located on the eastern portion of the island was designated as a Federal wilderness area in 1980. This is the only Federally-designated wilderness area in New York and contains the "Sunken Forest", one of the last remaining maritime forests on the eastern seaboard. In addition, four locations along the 52-mile Study area have been designated as New York State Important Bird Areas (Audubon 2002b). These include Fire Island, Great South Bay, Moriches Bay, and Shinnecock Bay. Four (4) additional Important Bird Areas are located within 15 miles of the Study area.

Twelve (12) specific community types (i.e., habitats) were documented and surveyed during avian sampling on the barrier island. The community types identified included ocean, beach, (which encompasses the intertidal zone, berm crest, wrackline, ephemeral pools, and supratidal zone), herbaceous, shrub, herbaceous/shrub, forest, forest/shrub, *Phragmites*, *Phragmites*/shrub, saltwater marshes (which encompasses small coastal ponds and tidal creeks), bay side intertidal flats, and the bay. Appendix A provides photographic documentation of each community type. A description of each community follows.

2.1 COMMUNITY TYPE DESCRIPTIONS

Ocean (OW-O)

The ocean type includes that portion of the open ocean that is visible from the barrier island beach using binoculars and spotting scopes. This community represents approximately 5.4% of the 330 acres surveyed on transects.

Beach (INT-O)

The beach community includes intertidal and supratidal areas and extends from the edge of the low tide line to the ocean side limit of the primary dune. The intertidal beach habitat of this community is located between the high and low tide marks, and generally contains wet sand and shallow ephemeral pools. Beyond the intertidal zone the supratidal zone contains sparse herbaceous vegetation with less than 5% cover, beach debris, tire ruts, small ephemeral pools, and old wrack lines. Herbaceous vegetation primarily consists of American beach grass

(*Ammophila breviligulata*). This community represents approximately 22% of the 330 acres surveyed on transects.

Herbaceous (HRB)

The herbaceous community includes herb-dominated areas of the primary dune and dunes and swales located in inner-island areas. Herbaceous cover is patchily distributed and interspersed with significant areas of bare sand. On the primary dune and inner-island areas, the vegetated portions of this community are dominated by American beach grass and typically contain less dominant species such as spurge (*Euphorbia polygonifolia*), beach plum (*Prunus maritima*), seaside goldenrod (*Solidago sempervirens*), beach heather (*Hudsonia tomentosa*), and sea rocket (*Cakile edentula*). In low-lying wet areas located within the inner-island, the herbaceous community is typically comprised of a variety of sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), rushes (*Juncus* spp.), swamp rose mallow (*Hibiscus palustris*), and goldenrods (*Solidago* spp.). Herbaceous cover is generally higher in the inner-island dune and swale areas located on the bay side of the primary dune. This community represents approximately 12% of the 330 acres surveyed on transects.

Shrub (SS)

The shrub community is located primarily in inner-island areas and is dominated by shrub, vine, and/or tree species < 10 feet in height. As with the herbaceous community, this community often is interspersed with significant areas of bare sand. Vegetated areas of the shrub community are typically dominated by shadbush (*Amelanchier canadensis*), bittersweet *(Celastrus scandens),* highbush blueberry *(Vaccinium corymbosum),* common juniper *(Juniperus communis),* Japanese honeysuckle *(Lonicera japonica),* bayberry *(Myrica pensylvanica),* bearberry (*Arctostaphylos uva-ursi*), raspberry *(Rubus spp.),* greenbriar *(Smilax spp.),* and poison ivy *(Toxicodendron radicans).* In low-lying wet areas located within the inner-dune, the shrub community is typically dominated by species such as groundsel tree (*Baccharis halimifolia),* marsh elder *(Iva frutescens),* blueberry, cranberry (*Vaccinium macrocarpon*), bearberry, poison ivy, greenbriar. The shrub community represents approximately 13% of the 330 acres surveyed on transects.

Herbaceous/Shrub (HSS)

The herbaceous/shrub community is represented by a diverse assemblage of herbaceous and shrub species (see herbaceous and shrub descriptions for a list of representative species). The herbaceous/shrub community is generally found throughout inner-island dune and swale areas and represents approximately 8.6% of the 330 acres surveyed on transects.

Forest (FOR)

The forest community is located toward the bayside of inner-island areas and is dominated by stunted (< 20 feet in height) tree species, including pitch pine (*Pinus rigida*), black oak (*Quercus velutina*), red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), sassafras (*Sassafras albidum),* and black cherry (*Prunus serotina*). This community typically has a

relatively sparse understory of shrub and/or vine species that may include poison ivy, greenbriar, shadbush, multiflora rose (*Rosa multiflora*). Forest communities are generally stunted due to harsh barrier island environments. Included in this community type is the Sunken Forest, a 200+ year-old stunted forest dominated by American holly, sassafras, and shadbush. The forest community represents approximately 5.5% of the 330 acres surveyed on transects.

Forest/Shrub (FSS)

The forest/shrub community comprises a mixture of forest and shrub species (see forest and shrub descriptions for a list of representative species). The forest/shrub community is generally found toward the bayside of inner-island areas and represents approximately 13.9% of the 330 acres surveyed on transects.

Salt marsh (SM)

The saltmarsh community is located primarily on the bayside of inner-island areas and is dominated by emergent salt marsh species such as saltmeadow cordgrass (*Spartina patens),* and saltmarsh cordgrass *(Spartina alterniflora).* Other less dominant species include goldenrod, sedge and rush species. The salt marsh community is typically found in low-lying areas that receive direct tidal input from the bay and represent 3.7% of the 330 acres surveyed on transects.

***Phragmites (*PH)**

Phragmites is a mono-typic, invasive plant community that is located primarily on the bayside of inner-island areas and is dominated (>50% cover) by common reed (*Phragmites australis*). The *Phragmites* community represents approximately 0.9% of the 330 acres surveyed on transects.

***Phragmites*/Shrub (PHS)**

The *Phragmites*/shrub community is a mixture of *Phragmites* and a variety of scrub species, including groundsel tree, blueberry, marsh elder, and poison ivy, dominates this community. This community is typically found along the transition zone from salt marsh communities and/or *Phragmites*-dominated communities into drier upland areas. The *Phragmites*/shrub community represents approximately 5.6% of the 330 acres surveyed on transects.

Bay Intertidal Flats (INT-B)

The intertidal flats community is found along the bay shoreline and is located between the high and low tide marks. This community is un-vegetated and generally contains wet sand and/or mud, cobble, shallow ephemeral pools, and significant wrack and debris. Intertidal flats represent approximately 3.5% of the 330 acres surveyed on transects.

Bay (OW-B)

Bay habitat includes the open water portion of the bay that is visible from the intertidal areas along the bay using binoculars and spotting scopes, and those areas visible while traveling to transects via boat. The bay community represents approximately 5.1% of the 330 acres surveyed.

2.2 PLACEMENT OF SURVEY TRANSECTS

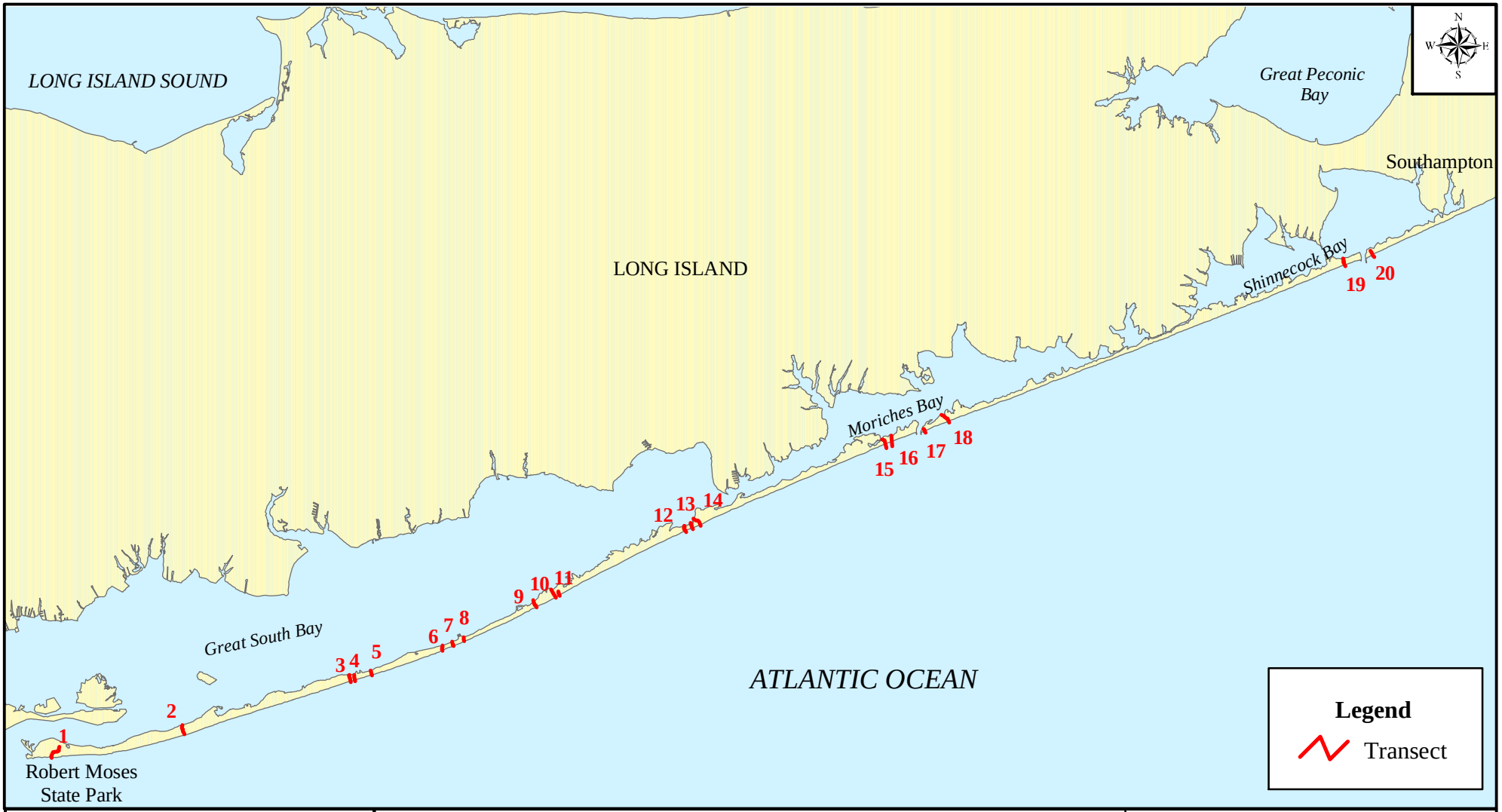
Survey transects were spread out across approximately 52-miles of the barrier island to ensure that all of the predominant community types found on the island were surveyed. Because the barrier island is so dynamic and subjected to microclimatic variations of wind, waves, and temperature, the various community types were found in a variety of locations, microsite types and extents; sampling in the different locations helped to ensure that the diverse conditions were investigated.

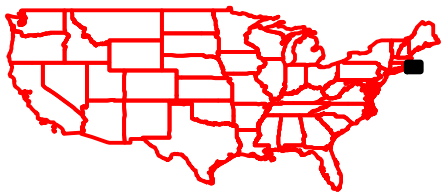
Transects were located from East Hampton westward to the western-most point of Robert Moses State Park (Figure 2). With the exception of the ponds and lakes targeted by the U.S. Fish and Wildlife Service (USFWS), the habitats surveyed are similar in vegetative composition as those areas surveyed by the USFWS in 1982 in support of the USACE's Fire Island Inlet to Montauk Point, New York, Beach Erosion Control and Hurricane Protection Project Reformulation Study (USFWS 1983). Twenty (20) transect lines were established at approximately north-south directions in eight general survey areas as follows, Robert Moses State Park (Transects 1 and 2), Sailors Haven (Transects 3, 4 and 5), Barrett Beach (Transect 6, 7 and 8), Watch Hill (Transects 9, 10, and 11), Old Inlet (Transects 12, 13, and 14), Smith Point (Transects 15 and 16), Cupscogue Beach (Transects 17 and 18), and Shinnecock Bay Inlet (Transects 19 and 20). Figures 3a through 3h show transect locations.

In general, the eight survey locations of this study are very similar to one another in the types of habitats encountered (Table 1). However, some notable differences include significant stunted forest and forest/shrub communities within the Sunken Forest, located near Watch Hill (Transects 3, 4, and 5) and the presence of salt marsh communities on Transects 10, 14, 15, 16, 17, 18, and 19. In addition, vegetation within transects 12, 17, 19, and 20 consist primarily of only herbaceous and low-growing sparse herbaceous/shrub and shrub. Sixteen of the 20 transects included some component of the invasive species *Phragmites*.

Typical of barrier islands, the microtopographic distribution of vegetated habitats is similar across the island (Figure 4). Forest, forest/shrub, and shrub communities are located primarily on the protected areas of the island, from the bay side of the island to approximately mid-way across the island. Salt marsh and *Phragmites* communities are associated with the low-energy bayside of the island. Hardy, low-growing herbaceous/shrub and herbaceous communities are typically located from the center of the island to the back and top of the primary dune. The face of primary dunes and beach supratidal areas contain sparse coverage of low-growing beach grass. The primary dunes generally range in height from 4 feet to 12 feet and have shear faces on the oceanside. The stratification of communities across the island, primary dune configuration, and stunted tree growth, result primarily from wind forces

and wave action that cut across the island from the ocean toward the bay, with the bayside of the island being more protected from such forces.





Project Location

0 2.5 5 10 15

Scale in Miles

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999

Figure 2. Locations of Sampling Transects for the Fire Island Avian Study.

Prepared For: United States Army Corps of Engineers, New York District

Date: 10/03

Prepared By: NEA

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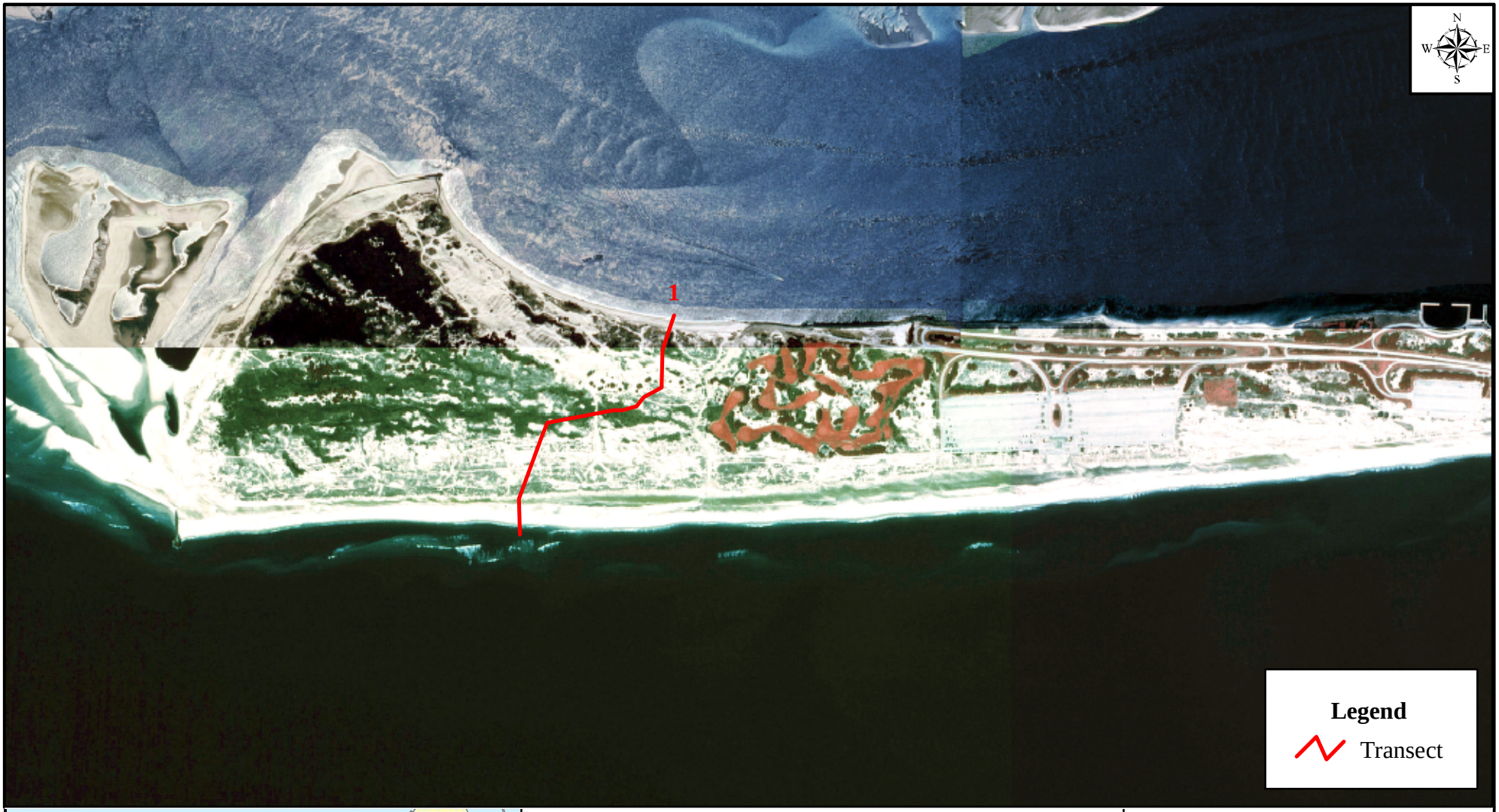
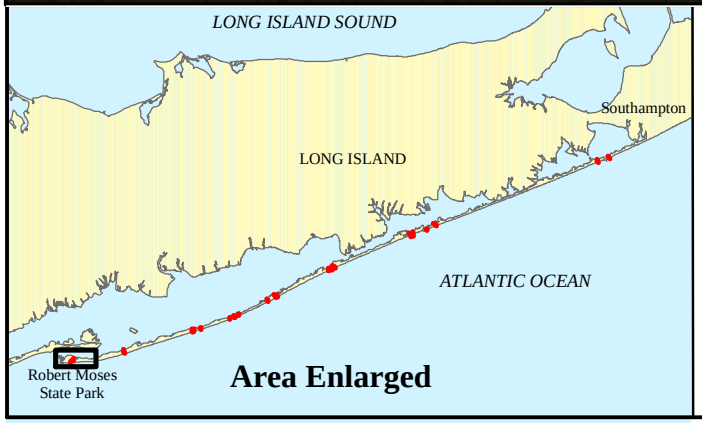
Table 1. Area of Community Types within Fixed Plot Bird Surveys.

Transect	Habitat*												Total Acres
	OW-O	INT-O	HRB	HSS	SS	FOR	FSS	SM	PH	PHS	INT-B	OW-B	
1	0.62	2.14	5.73	3.43	-	2.52	6.02	-	-	-	1.53	0.62	**22.61**
2	0.62	3.03	0.46	1.62	0.97	0.83	2.18	-	0.23	0.31	0.36	0.62	**11.23**
3	0.62	1.80	2.52	1.48	2.58	1.19	2.12	-	-	1.06	0.44	0.62	**14.43**
4	0.62	2.80	0.67	0.85	0.94	1.39	1.20	-	-	0.14	0.35	0.62	**9.58**
5	0.62	1.64	1.45	0.79	1.40	0.51	0.87	-	-	-	0.15	0.62	**8.05**
6	0.62	2.00	-	0.18	1.42	0.72	2.39	-	-	0.44	0.11	0.62	**8.5**
7	0.62	1.94	0.12	0.36	0.93	1.25	1.06	-	0.21	0.05	0.15	0.62	**7.31**
8	0.62	2.34	0.27	0.19	0.77	0.12	0.76	-	-	0.10	0.47	0.62	**6.26**
9	0.62	1.92	0.48	0.83	2.45	0.70	3.55	-	0.30	0.30	0.21	0.62	**11.98**
10	0.62	1.72	0.56	0.66	2.06	-	2.12	2.83	0.18	0.59	0.32	0.62	**12.28**
11	0.62	1.73	0.39	0.57	2.07	0.94	1.25	-	-	-	-	-	**7.57**
12	0.62	3.67	0.59	0.93	2.36	-	-	-	0.32	1.19	0.39	0.62	**10.69**
13	0.62	2.50	0.73	1.22	1.89	-	1.24	-	-	0.40	0.41	0.62	**9.63**
14	0.62	2.37	0.97	1.70	3.60	1.08	2.02	0.28	-	2.04	0.73	0.62	**16.03**
15	0.62	3.73	2.17	0.33	2.57	0.41	1.67	0.29	0.11	1.19	0.64	0.62	**14.35**
16	0.62	4.04	1.29	1.24	1.96	-	2.55	1.29	0.42	0.94	0.26	0.62	**15.23**
17	0.62	1.67	2.15	0.37	-	-	-	0.30	-	0.28	0.25	0.62	**6.26**
18	0.62	2.23	0.96	1.79	1.77	0.92	0.91	2.47	-	3.06	0.34	0.62	**15.69**
19	0.62	4.19	2.78	0.64	0.30	-	-	0.98	0.37	0.89	0.77	0.62	**12.16**
20	0.62	3.13	4.31	0.58	0.64	-	-	-	-	-	0.22	0.62	**10.12**
Total Acres	**12.4**	**50.59**	**28.6**	**19.76**	**30.68**	**12.58**	**31.91**	**8.44**	**2.14**	**12.98**	**8.1**	**11.78**	**229.96**
%	**5.4**	**22.0**	**12.4**	**8.6**	**13.3**	**5.5**	**13.9**	**3.7**	**0.9**	**5.6**	**3.5**	**5.1**	

* Key = OW-O = ocean, INT-O = beach, HRB = herbaceous, HSS = herbaceous/shrub, SS = shrub, FOR = forest, FSS = forest/shrub, SM = saltmarsh, PH = *Phragmites*, PHS = *Phragmites*/shrub, INT-B = bayside intertidal flats, OW-B = bay.





0 500 1,000 2,000

Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3a. Location of Transect 1 for the Fire Island Avian Study.

Prepared For:	**United States Army Corps of Engineers, New York District**	**Date:** 10/03
Prepared By:	NEA	

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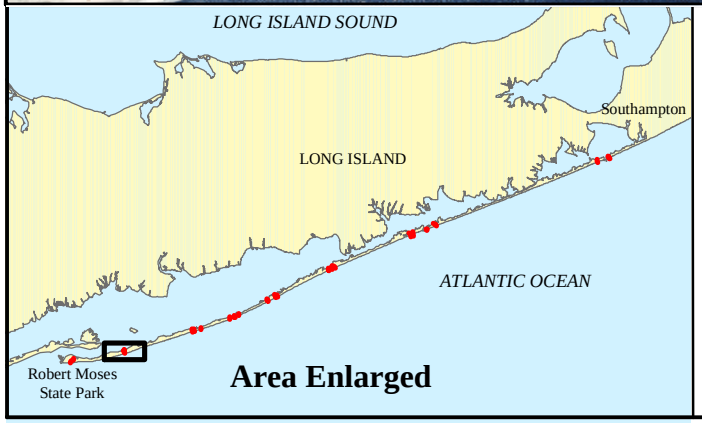

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Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3b. Location of Transect 2 for the Fire Island Avian Study.

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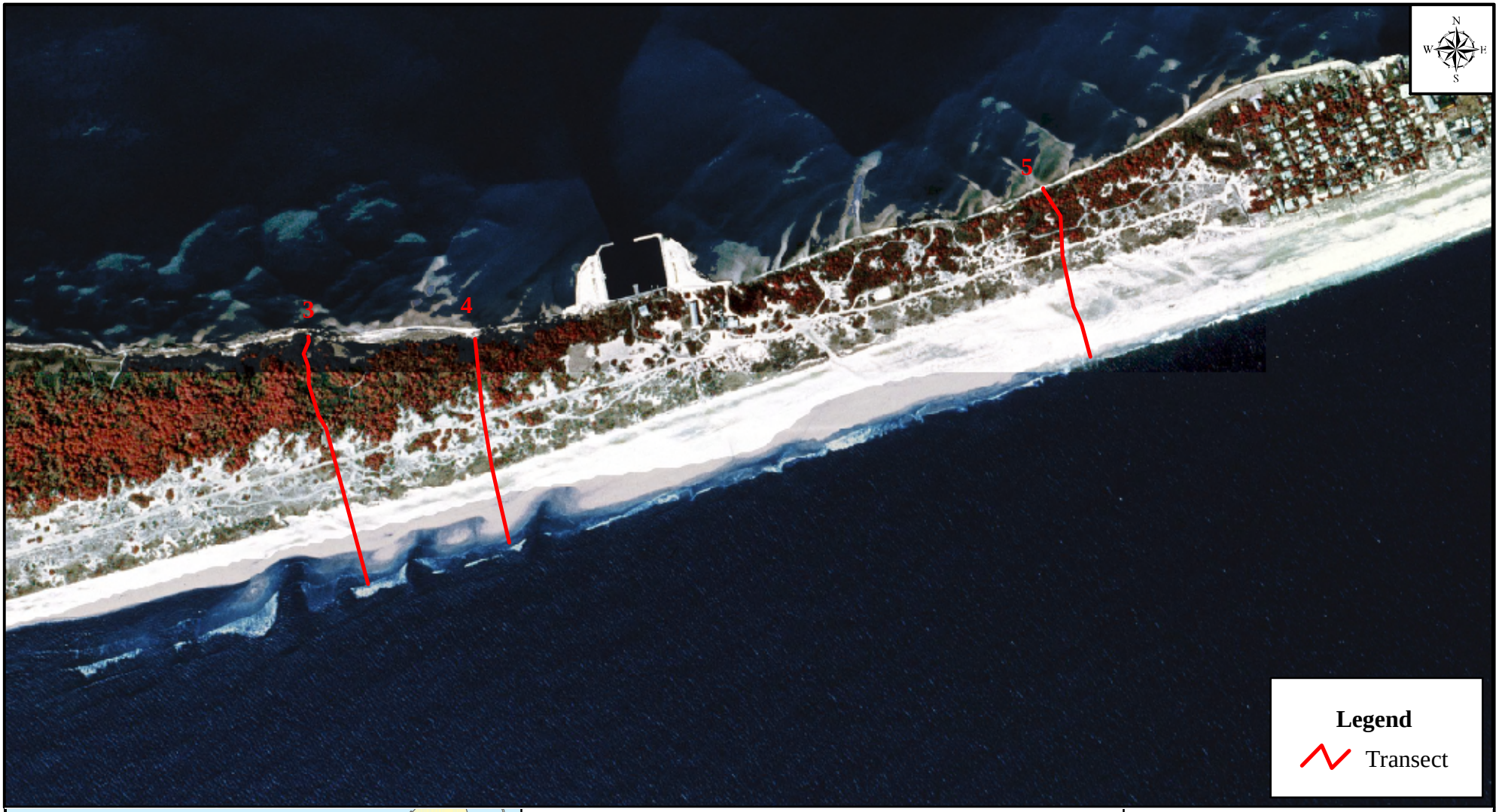

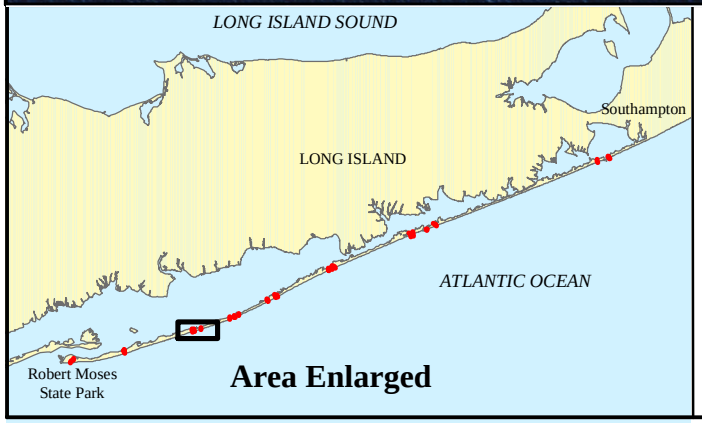

0 500 1,000

Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3c. Location of Transects 3, 4, and 5 for the Fire Island Avian Study.

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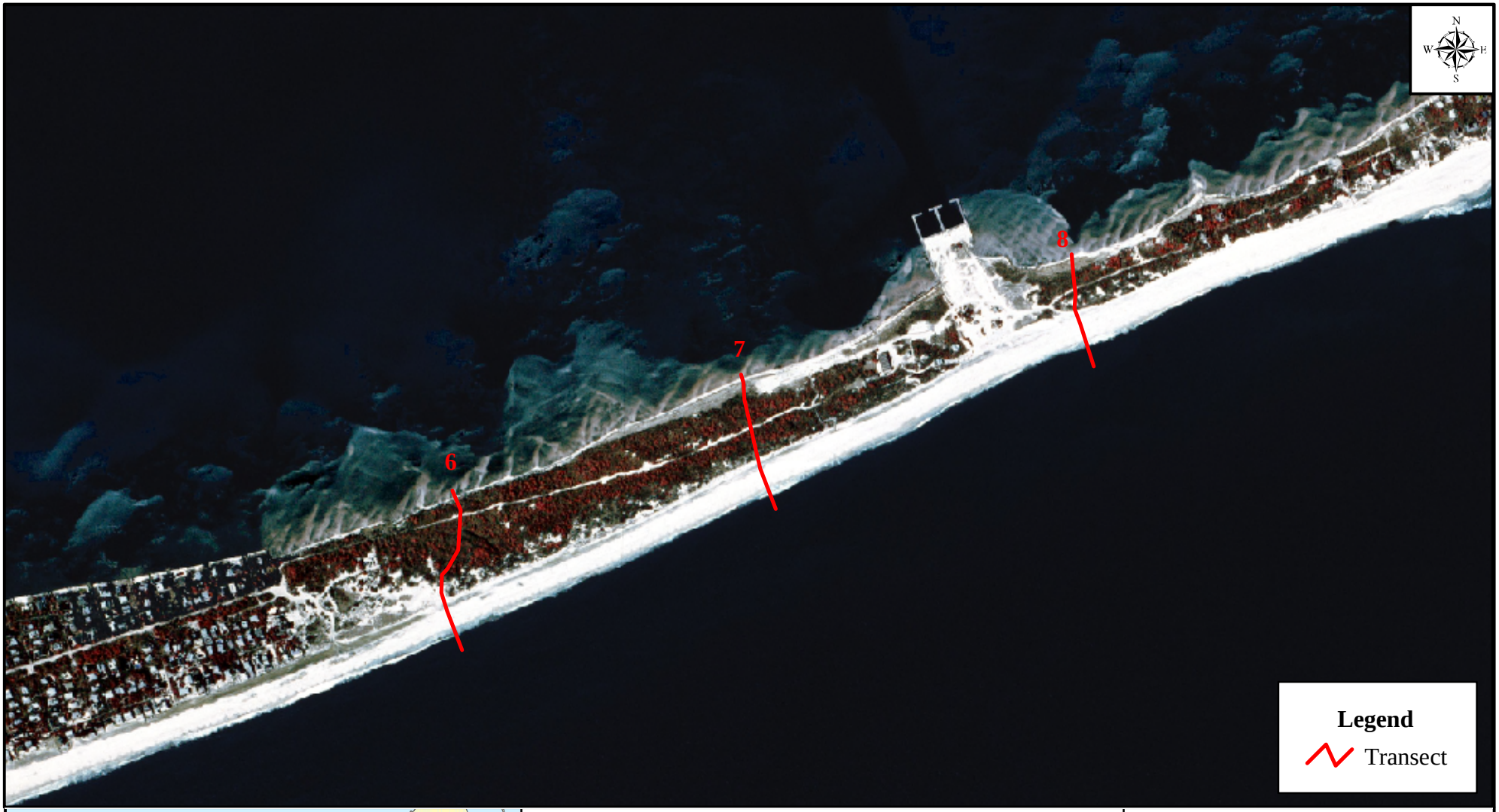

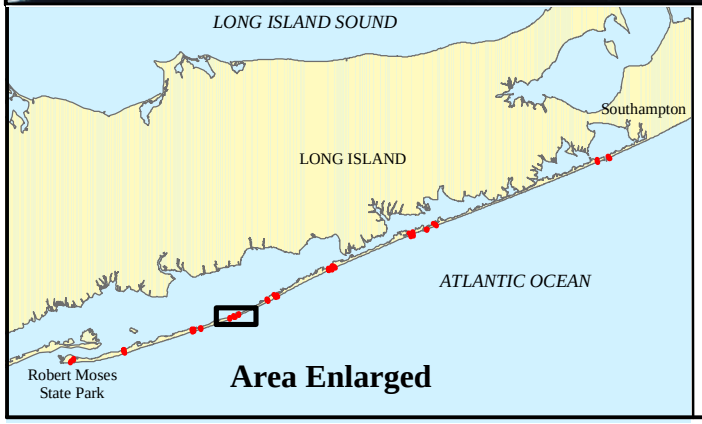

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Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3d. Location of Transects 6, 7, and 8 for the Fire Island Avian Study.

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Prepared By:	NEA	

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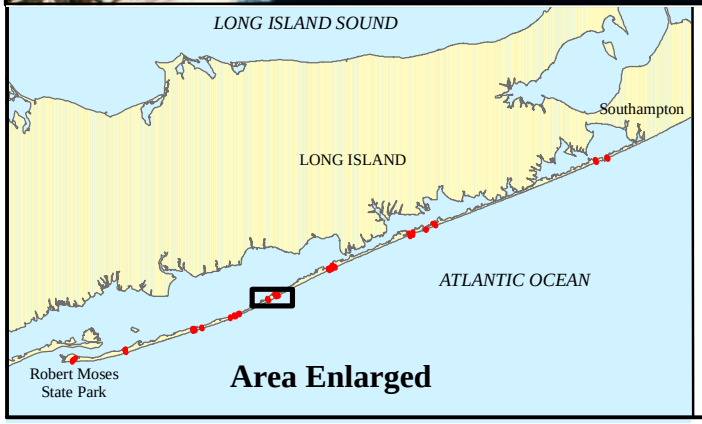

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Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3e. Location of Transects 9, 10, and 11 for the Fire Island Avian Study.

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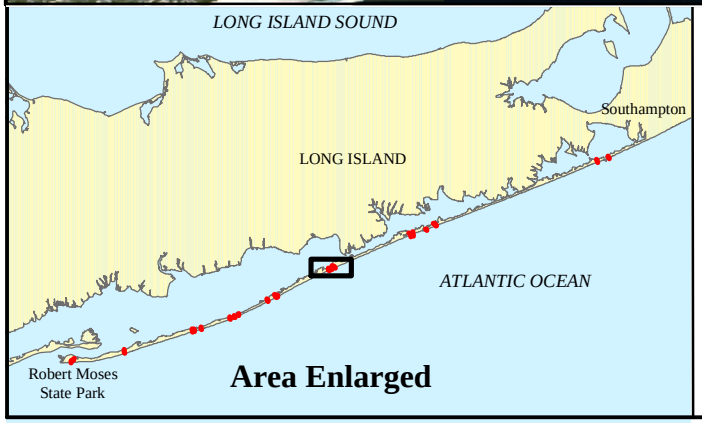

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Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3f. Location of Transects 12, 13, and 14 for the Fire Island Avian Study.

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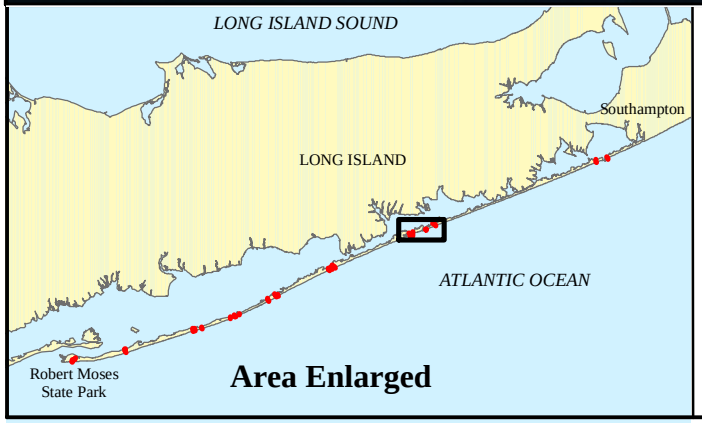

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Scale in Feet

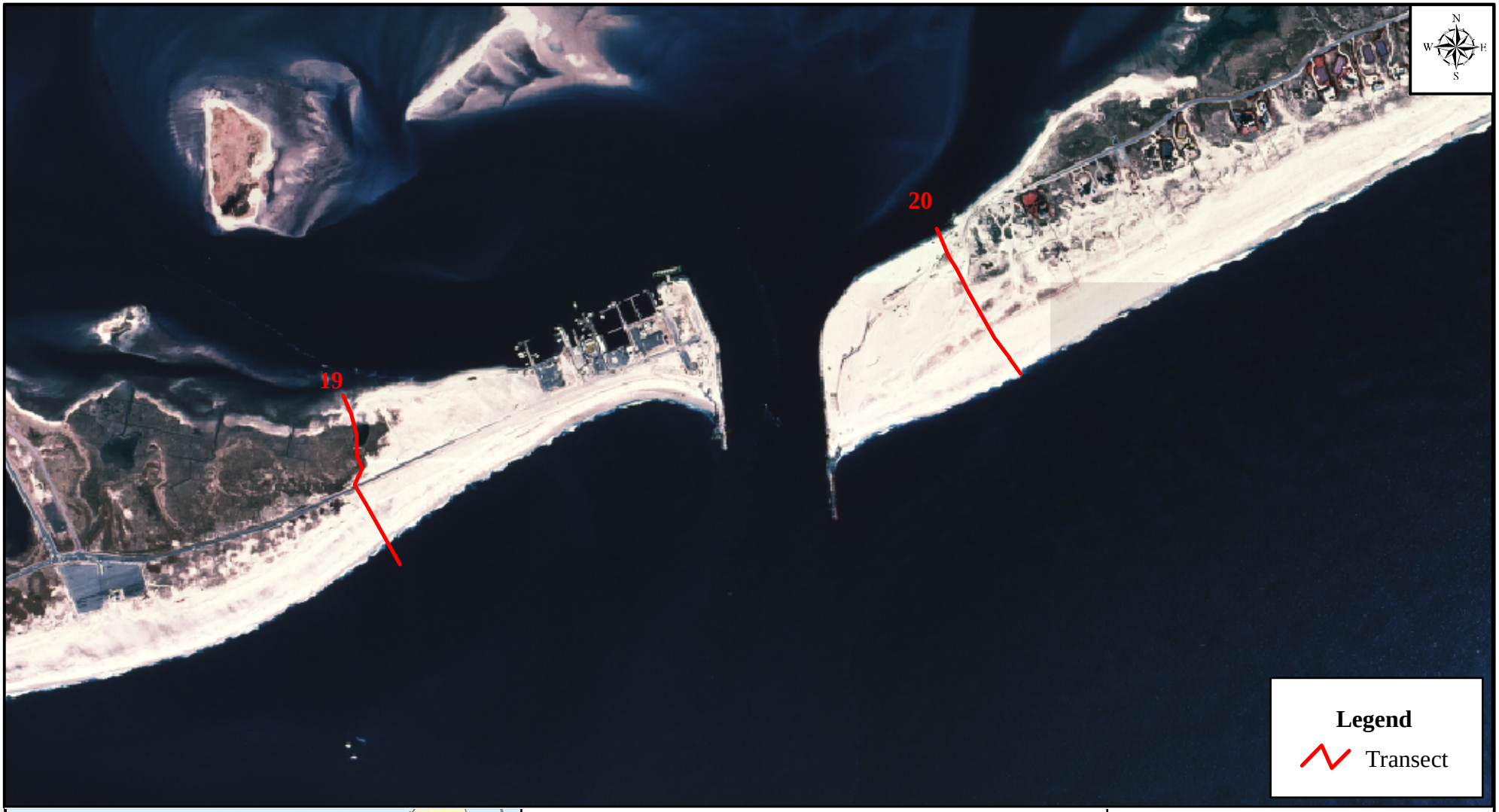
Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

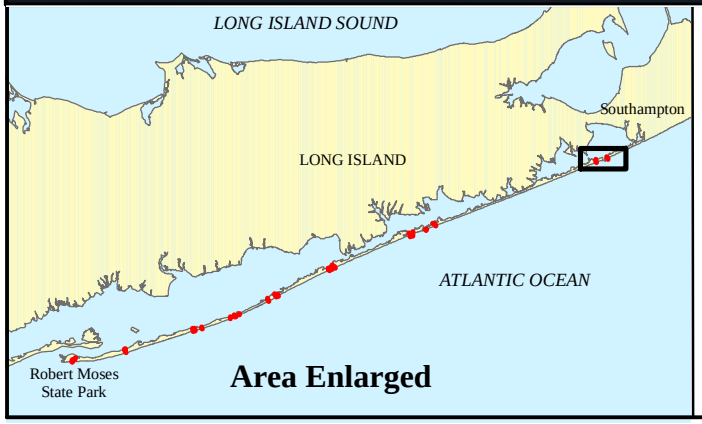
Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3g. Location of Transects 15, 16, 17, and 18 for the Fire Island Avian Study.

Prepared For:	**United States Army Corps of Engineers, New York District**	**Date:** 10/03
Prepared By:	NEA	

z:/projects/Fireislandgps/maps/Avianfinal/report_figsTrans.mxd





0 500 1,000

Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 3h. Location of Transects 19 and 20 for the Fire Island Avian Study.

Prepared For: United States Army Corps of Engineers, New York District

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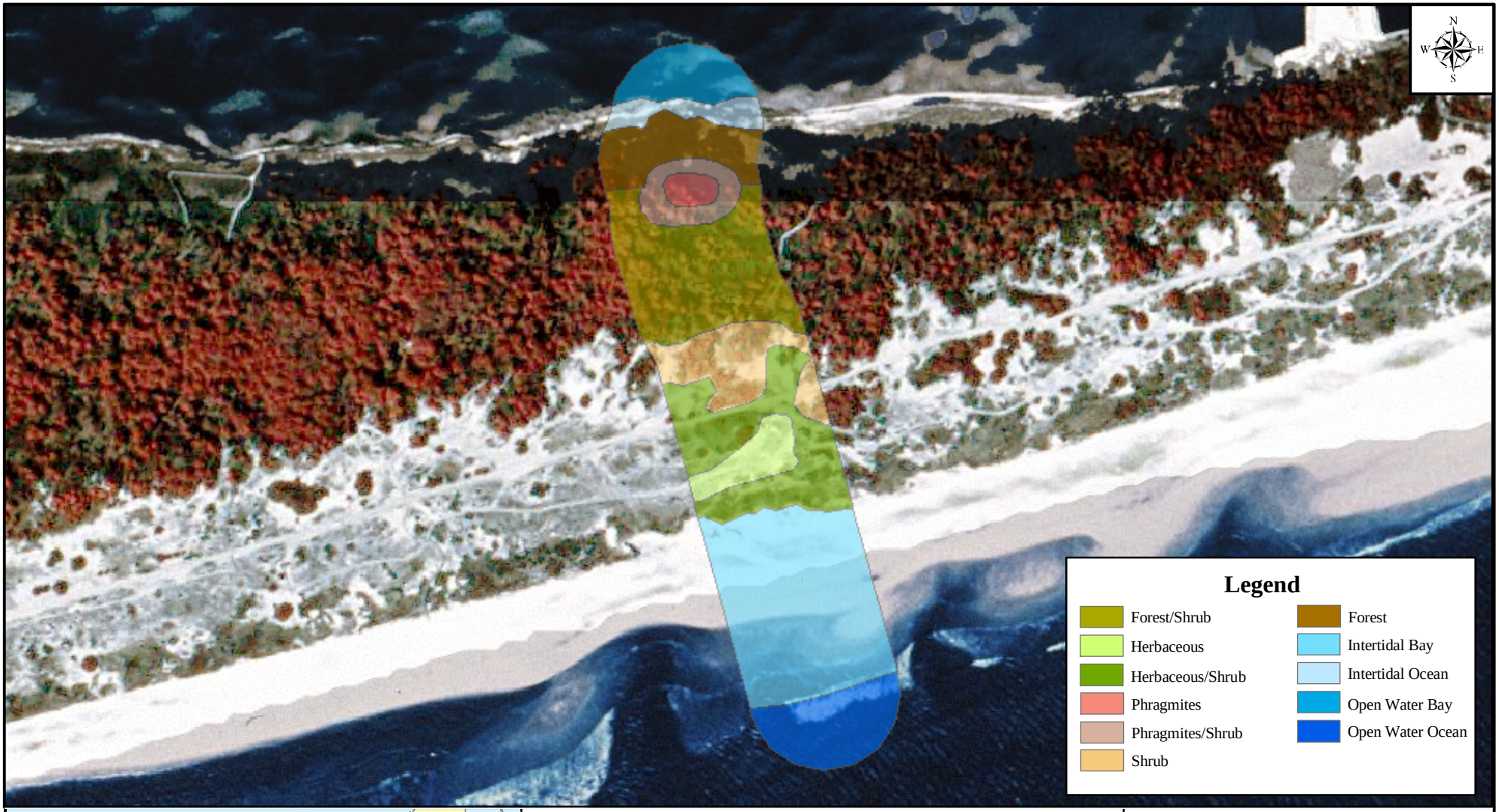
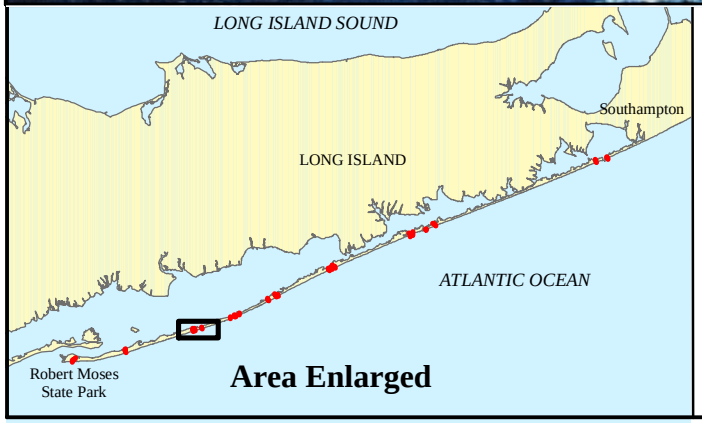
Prepared By: NEA

z:/projects/Fireislandgps/maps/Avianfinal/report_figsTrans.mxd





0 500 1,000

Scale in Feet

Shore Protection and Storm Damage Reduction Project, South Shore of Long Island, New York

Source: ESRI Data and Maps CD, 1999. New York DOQQ, 1999.

Figure 4. Typical Distribution of Barrier Island Community Types Surveyed for the Fire Island Avian Study.

Prepared For: United States Army Corps of Engineers, New York District

Date: 10/03

Prepared By: NEA

z:/projects/Fireislandgps/maps/Avianfinal/report_figsTrans.mxd

3.0 METHODOLOGY

In order to identify the composition and relative abundance of avian communities utilizing the barrier island, a variety of bird census methods were utilized, and background data and documented studies were consulted. Field investigations were conducted from May 2002 through May 2003 using avian transect survey techniques, observation counts, and incidental observations. Research and review of background data regarding avian distribution in the Project area included sources such as the USFWS Fire Island Avian Survey Summary Report (USFWS 1983), North American Breeding Bird Atlas (Sauer et al. 2001), New York State Breeding Bird Atlas Project (NYDEC 2002), Audubon New York Important Bird Area Program (Audubon 2002b), Fire Island Hawk Watch (FIRE 2002), Fire Island National Seashore (FINS) research reporting system (NPS 2002), National Audubon Christmas Bird Counts for Long Island (National Audubon 2002), and NatureServe Web Encyclopedia of Species (NatureServe 2002). The checklist of birds likely to occur on the barrier island, breeding status, and relative abundance classifications are consistent with that presented in the USFWS Fire Island avian survey summary report (USFWS 1983).

3.1 FIELD SAMPLING DESIGN

A field sampling approach that utilized multiple methods was used to develop the most comprehensive species list for the Study area. Specific methods used to census birds included fixed observation stations to target the non-vocal wading/waterbirds that tend to have clumped distributions along the near shore areas (i.e., open water, intertidal flats, and shoreline), belt transects to target vocal species that are typically more evenly distributed in vegetated community types, and documentation of incidental sightings throughout the Study area. In addition, survey activities were conducted over a wide range of weather and time-of-day conditions over the course of the study, to account for the variation in activity patterns that occurs among the different species under different tidal and seasonal conditions. Transect surveys and ocean and bayside observations were conducted in the dominant barrier island community types and were located from East Shinnecock Bay to the western border of Robert Moses State Park. Appendix B includes field notes from survey activities.

Species were identified visually and/or by song. Species identifications were confirmed using The Sibley Guide to Birds (Sibley 2000), Peterson Field Guide to Eastern Birds (Peterson 1980), Stokes Field Guide to Birds: Eastern Region (Stokes 1996a), and the Stokes Audio Guide to Bird Identification (Stokes 1996b).

Transect Surveys

Transect surveys were used primarily to develop the species list for passerine communities within vegetated habitats in the Study area. Surveys were conducted along 20 transects each encompassing dominant community types found on Fire Island (Figure 2 and 3a through 3h). See Section 5.0 for community type descriptions. Each transect bisected Fire Island in approximately a north-south direction (i.e., ocean to bay).

Observers slowly traversed pre-established transect lines and recorded all birds seen or heard while traversing each transect. All species seen or heard were used to develop a list of species for the Study. Birds located within 50 m of the transect centerline were used to calculate estimates of relative abundance. Sampling activities were conducted primarily between 6:00 AM and 10:00 AM to capture the period when birds are typically most active and vocalizing/defending territories. However, because of the overall objective to develop a comprehensive species list, sampling was conducted beyond 10:00 AM in instances where bird activity and vocalizations remained high. All transect surveys were conducted under various rain and cloud cover conditions, so long as birds remained audible and active. Transects surveyed under conditions of rain or strong winds, were targeted on "good" weather days during subsequent survey events.

Additional information recorded included the general weather conditions, species, whether the species was within or outside of the 50 m transect, and the habitat that the species was observed in. In addition, the dominant community types within 75 m of the transect centerline were documented and a habitat map for the immediate transect areas was produced. Transect lines were recorded using a Trimble Pro-Mark IV Global Positioning System (GPS) and superimposed on habitat maps.

Observation Surveys

Observation surveys were used to target avian communities that may be found in and along open waterbodies and exposed sand bars and islands of the Study area. Surveys were conducted along intertidal areas on the ocean and bay sides of the island (in close proximity to transects 1 through 20), and were conducted from a boat while navigating the bay to access transects. In addition, observation surveys were conducted in isolated wetland areas and pools throughout the Study area and along the intertidal area on Democrats Point (i.e., easternmost point of Robert Moses State Park). These surveys were conducted at various times throughout the day, under various weather conditions, and during a wide range of tidal conditions. Observers recorded all birds seen or heard while walking between transects along intertidal areas along the ocean and bay and while navigating to transects on the bay via boat. In addition, observations of the bay, intertidal flats, beach, and ocean were conducted for 10 minutes at the beginning and end of each transect (Figure 2 and 3a through 3h).

Incidental Sightings

All incidental sightings of species utilizing habitats on Fire Island were documented. Incidental sightings were recorded for areas located within the Study area and while traveling from one transect location to another. Incidental sightings included species observed from the boat while navigating Shinnecock, Great South, and Moriches bays. Boat observations also included random assessments of bird activity on bayside islands and sandbars.

3.2 SAMPLING ACTIVITIES

Two to four-person survey teams conducted avian sampling activities monthly from May 2002 through June 2002, and September 2003 through May 2003. Survey teams consisted of

at least one experienced Senior Ornithologist. USACE biologists conducted surveys in July and August of 2002. Each transect and observation area was surveyed once over a 1-week period per month, with the exception of May and June surveys, which were surveyed twice over a 2-week period because of the extensive amount of breeding season bird activity. Table 2 identifies the survey periods and general weather conditions encountered during each survey event.

Table 2. Survey Dates and General Weather Conditions of Avian Surveys for the Fire Island Bird Study.

Survey Event	Dates	Temp. Range (°F)	General Weather Conditions
1	5/13 – 5/16, 2002	45 - 55	Cloudy and windy throughout, heavy rain on 1st day of survey
2	5/20 – 5/24, 2002	45 - 65	Windy and clear, some scattered clouds on last survey day
3	6/3 – 6/8, 2002	60 - 70	Windy and clear through mid-week, clouds and some fog end of week, rain 1-day postponed surveys
4	6/17 – 6/21, 2002	60 - 75	Breezy and scattered clouds
5	July, 2002		Information not available
6	August, 2002		Information not available
7	9/30 – 10/4, 2002	65 - 75	Breezy and sunny, turning cloudy at end of week, drizzle on last survey day
8	10/28 – 11/1, 2002	40 - 50	Windy and overcast for most of survey
9	11/11 – 11/15, 2002	50 - 65	Windy, fog and pouring rain at start, clear conditions near end of survey
10	12/9 – 12/13, 2002	25 - 30	Windy and clear, patchy snow on island, bay mostly ice-covered, some clouds mid-week
11	1/28 – 1/ 31, 2003	8 - 25	Windy and overcast, flurries mid-week, drizzle on last day, patchy snow on island, bay mostly ice-covered
12	2/24 – 2/26, 2003	25 - 30	Windy and cloudy
13	3/18 – 3/22, 2003	35 - 50	Breezy and foggy at start, turning windy mid-week
14	4/15 – 4/19, 2003	40 - 50	Breezy, sunny with occasional clouds mid week, turning windy at end of survey
15	5/5 – 5/9, 2003	50 - 65	Calm and sunny at start, wind, fog and drizzle mid-week
16	5/19 – 5/23, 2003	50 - 60	Breezy and sunny at start, windy and rain through end of week

3.3 DATA ANALYSIS

Information from observation surveys and incidental sightings were used to develop a comprehensive species list and assessments of species richness for the Study area. Species richness was the number of a given species that occurred on transect and observation surveys, or incidental observation during the 1-year survey period.

The principal measure of avian abundance in this study was density. Relative density (i.e., abundance) of each species in each habitat was the mean number of individuals counted within the 50 m belt transect, per acre of habitat surveyed within all 50 m transects. During the breeding season, most of the individuals counted were territorial singing males identified primarily by their song. Surveys conducted during migration and wintering seasons, were primarily visual identifications of non-territorial birds and included both males and females.

Data from observation surveys and incidental sightings were not included in species habitat use assessments or density calculations. Similarly, the USACE transect data from July and August was not included in species density calculations or habitat use assessments because of variations in method of data collection and type of data collected. Specifically, the data did not contain sufficient information to identify whether the species was observed within or outside of the 50 m transect, or the habitat the species was observed in.

4.0 RESULTS

Over 17,500 observations of birds, comprising one hundred sixty-two (162) species, were identified during the 1-year of survey activities. Appendix C provides a list of species likely to occur in the Project area, birds observed during this survey, and the seasonal abundance and seasonal occurrence status of each species as defined by USFWS (USFWS 1983). A summary of species detections, seasonal use, transect/habitat use, and the presence of Threatened and/or Endangered species are provided below.

4.1 SPECIES DETECTIONS

Overall, the most commonly observed species throughout all seasons (i.e., migration, breeding, wintering) and using all survey methods were the herring gull (*Larus argentatus*) and greater black-backed gull (*Larus marinus*) with over 1,000 individuals of each species, red-winged blackbird (*Agelaius phoeniceus*) with 823 individuals, and yellow-rumped warbler (*Dendroica coronata*) with 802 individuals recorded over the course of the survey period. These species made up approximately 25% of all individuals sighted over the entire survey period. Other very common species included American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), barn swallow (*Hirundo rustica*), black-bellied plover (*Pluvialis squatarola*), black scoter (*Melanitta nigra*), bufflehead (*Bucephala albeola*), common grackle (*Quiscalus quiscula*), common tern (*Sterna hirundo*), common yellowthroat (*Geothlypis trichas*), dark-eyed junco (*Junco hyemalis*), double-crested cormorant (*Phalacrocorax auritus*), European starling (*Sturnus vulgaris*), gray catbird (*Dumetella carolinensis*), mourning dove (*Zenaida macroura*), rufous-sided towhee (*Pipilo erythrophthalmus*), sanderling (*Calidris alba*), song sparrow (*Milospiza melodia*), and tree swallow (*Iridoprocne bicolor*). These species, which represent 10% of the overall species observed, combined made up approximately 22% of the individuals sighted during the 1-year survey. Over 200 individuals of each of these species were sighted from transect survey routes.

These observations include a significant number of individuals that were observed outside of the 50 m belt transects. Most of these included high numbers of wintering waterbirds and cormorants, resident species found on the island year round, and large flocks of migrating shorebirds. The most commonly observed species documented within the 50 m transect, and likely utilizing the community types for breeding purposes, were common yellowthroat, gray catbird, dark-eyed junco, rufous-sided towhee, red-winged blackbird, song sparrow, and yellow-rumped warbler. Each of these species had greater than 200 individuals documented within the 50 m transect throughout the course of the Study.

The USFWS interviewed reputable ornithologists, and conducted a thorough review of background information and existing data to compile a list of those species most likely to occur in the vicinity of the Project area. Based on this work, the USFWS identified two hundred and forty-two (242) bird species as most likely to occur in the Project area (USFWS 1983). The USACE avian study (2002-2003 surveys) identified 156 of the 243 species identified as likely to occur by USFWS (Appendix C). In addition, this Study documented an

additional six species not included on the USFWS list. One hundred twenty (120) of the 242 birds are considered rare or uncommon visitors to the island during any given season (e.g., migration, breeding and/or wintering). Of the 122 species that are considered common or abundant on the barrier island during any given season, 112 of these species were documented during this study (Appendix C).

4.2 SEASONAL USE

Based on the breeding status designations identified by USFWS for bird species on Fire Island (USFWS 1983), a total of 47 of the 162 bird species observed during this study were identified as year-round resident breeding birds, 21 are migratory birds that use the site only during the spring/summer for breeding, 61 were identified as migratory species that pass through the site on their way to breeding and wintering grounds, 2 are documented as occasional visitors, and 31 were identified as winter residents (Appendix C).

The highest numbers of individuals observed during transects surveys (in and out of 50-m width) were recorded in May (average of 1,242 per transect per monthly survey event), June (1,385), August (1,649), and November (2,509). Most (2,086) of the observations recorded during the November survey were flyovers, migrating shorebirds, and/or rafting waterbirds located outside of the 50 m transect. The fewest numbers of individuals were recorded in February (439) and March (381). Observations within the 50 m transect were also low in January (85). However, significant numbers of flyovers and rafting waterbirds helped to elevate the overall number of individuals observed to 635.

Spring Migration

Fifty-five (55) species (34% of all species observed) and 774 individuals were recorded during the spring migration (March and April). The most common species were common grackle, and red-winged blackbird, which combined made up 28% of all observations. However, most of these observations were of birds flying over transects. Forty-three (43) percent of the birds were recorded within the 50 m transects, the remaining were observed outside of transects or as flyovers. The most common species observed using habitats within the 50 m transects were red-winged blackbird, song sparrow, bufflehead, common grackle, dunlin, mourning dove, and yellow-rumped warbler. During spring migration, beach, intertidal mudflat and bay habitats had the highest habitat use and accounted for 38% of all habitat use within transects. Forest and shrub habitats combined accounted for 28% of habitat use.

Breeding Season

One hundred and fourteen (114) species (71% of all species observed) and 3,042 individuals were recorded during the breeding season (May through July). The most common species were, black-bellied plover, common tern, least tern greater and herring gulls, gray catbird, and sanderling. Over 100 individuals of each of these species were recorded between May and July. Fifty-five (55) percent of the birds were recorded within the 50 m transects, the

remaining were observed outside of transects or as flyovers. This includes 609 observations (20%) that could not be directly tied to transect habitats due to inconsistencies in data collection method during the July survey. The most common species recorded on habitats located within the 50 m transect included rufous-sided towhee, red-winged blackbird, and song sparrow. During the breeding season, the highest habitat use occurred in intertidal areas along the ocean and bay, which combined accounted for 32% of all habitat use within transects. In addition, forest/shrub and shrub habitats accounted for 31% of all habitat use.

Fall Migration

One hundred and two (102) species (63% of all species observed) and 4,516 individuals were recorded during the fall migration season (August through November). The most common species were, American crow, American robin, bank swallow, bufflehead, common tern, double-crested cormorant, European starling, common grackle, greater black-backed and herring gulls, northern junco, red-winged blackbird, sanderling, tree swallow, and yellow-rumped warbler. Over 175 individuals of each of these species were recorded between August and November. Twenty-two (22) percent of the birds were recorded within the 50-m transects, the remaining were observed outside of transects or as flyovers. This includes 1,407 observations (31%) that could not be directly tied to transect habitats due to inconsistencies in data collection method during the August survey. The most common species observed using habitats within the 50 m transects were northern junco, sanderling, and yellow-rumped warbler. During fall migration, forest/shrub and shrub habitats combined accounted for 50% of all habitat use within transects.

Wintering

Forty-five (45) species (28% of all species observed) and 1,703 individuals were recorded during the wintering season (December through February). Over 85% of all species recorded during the winter were located outside of the 50 m transect or flyovers, most of these included large numbers of waterbirds and gulls in open water areas of the ocean and bay. The most common species recorded were black scoter, greater black-backed and herring gulls, and surf scoter. Other common birds observed outside of the 50 m transects included black duck, brant, bufflehead, European starling, and ring-billed gull. The most common species within habitats in the 50 m transects were northern junco and yellow-rumped warbler. During the winter season, forest/shrub and shrub habitats combined accounted for 51% of all habitat use within transects.

4.3 HABITAT USE

Over the course of all surveys, an average of 43 species (230 individuals) were observed per transect within the 50 m transects. Transects with high numbers of species included Transects 3 and 18 with 55 species each, 14 and 2 with 53 species each, and 4 and 15 with 50 species each (Table 3). Of these, Transects 2, 14, and 15 also had high numbers of individuals. Transects 19 had the highest overall number of individuals (382) but did not have high numbers of species. The fewest species, and least number of individuals, were

documented on Transects 17 with 25 species and 99 individuals, and Transect 20 with 29 species and 122 individuals (Table 3).

Based on the amount of habitat surveyed on transects throughout the Study area, bayside intertidal flats have the highest species richness and abundance of all community types surveyed (Table 4). The ocean community has the lowest species richness and abundance (Table 4).

Of the 109 species documented within 50 m transects, 61 species were observed in < 2 community types. The remaining 48 species used > 2 communities. Table 5 identifies the number of habitats each species was recorded in during transect surveys.

Table 3. Number of Individuals and Species Observed within 50 m Transects May 2002 through May 2003.

Transect	Individuals[1]	Species[1]
1	298	45
2	308	53
3	253	55
4	228	50
5	154	41
6	178	43
7	186	30
8	148	36
9	293	49
10	172	47
11	177	36
12	218	40
13	181	37
14	330	53
15	317	50
16	281	49
17	99	25
18	272	55
19	382	41
20	122	29

[1] USACE July and August data excluded.

Table 4. Average Bird Species Richness and Density per Acre of Habitat.

Community Type	Acres	# Species	Avg. # Species/Acre [1]	# Individuals	Avg. # Individuals/Acre [1]
Ocean	12.4	1	0.1	4	0.3
Beach	50.6	25	0.5	471	9.3
Herbaceous	30.4	28	0.9	290	9.5
Herbaceous/Shrub	20.0	32	1.6	548	27.5
Shrub	30.7	49	1.6	978	31.9
Forest	12.6	47	3.7	403	32.0
Forest/Shrub	29.9	52	1.7	955	31.9
Saltmarsh	8.4	24	2.8	113	13.4
Phragmites	2.1	7	3.3	55	25.7
Phragmites/Shrub	13.0	24	1.9	351	27.0
Bay Intertidal Flat	8.1	35	4.3	297	36.7
Bay	11.8	15	1.3	131	11.1

[1] USACE July and August data excluded.

Table 5. Density of Bird Species per Acre in Each Community Type at the South Shore of Long Island Barrier Island.

	Community Types[2]												
Common Name	**OW-O**	**INT-O**	**HRB**	**HSS**	**SS**	**FOR**	**FSS**	**SM**	**PH**	**PHS**	**INT-B**	**OW-B**	**Number of Habitats Used**
American Crow	~	0.14	0.37	0.05	0.36	1.83	0.94	0.12	~	~	0.25	~	8
American Goldfinch	~	~	~	0.15	0.23	1.04	0.20	~	~	0.15	~	~	5
American Kestrel	~	~	~	0.05	~	~	~	~	~	~	~	~	1
American Oystercatcher	~	0.22	0.17	~	~	~	~	0.12	~	~	1.36	0.11	5
American Redstart	~	~	~	~	0.03	0.32	0.20	~	~	~	~	~	3
American Robin	~	~	~	0.05	0.46	0.80	0.23	~	~	~	0.12	~	5
American Woodcock	~	~	~	~	0.03	~	0.03	~	~	~	~	~	2
Barn Swallow	~	0.08	0.03	0.15	0.26	~	0.03	0.12	~	~	~	~	6
Black-and-White Warbler	~	~	~	~	~	0.24	0.07	~	~	~	~	~	2
Black-bellied Plover	~	0.71	~	~	~	~	~	0.12	~	~	2.97	~	3
Black-capped Chickadee	~	~	~	~	0.33	0.48	0.70	~	~	~	~	~	3
Black-crowned Night-Heron	~	~	~	~	~	~	0.03	0.12	~	~	0.12	~	3
Belted Kingfisher	~	~	~	~	~	~	~	0.12	~	~	0.12	~	2
Brown-headed Cowbird	~	~	0.10	0.29	0.59	0.40	0.70	~	~	0.08	~	~	6
American Black Duck	~	~	~	~	~	~	~	~	~	~	0.37	0.77	2
Black Skimmer[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Bobolink[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Boneparte's Gull[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Blackpoll Warbler	~	~	~	0.05	0.07	0.40	0.07	~	~	~	~	~	4
Brown Creeper	~	~	~	~	0.07	~	~	~	~	~	~	~	1
Brown Thrasher	~	~	~	0.10	0.20	0.08	0.20	~	~	0.08	~	~	5
Black-throated Blue Warbler	~	~	~	~	~	0.24	0.13	~	~	~	~	~	2
Boat-tailed Grackle[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Black-throated Green Warbler	~	~	0.03	~	0.07	0.24	0.03	~	~	~	~	~	4
Bufflehead	~	~	~	~	~	~	~	~	~	~	~	1.38	1
Blue-winged Warbler	~	~	~	~	~	~	0.03	~	~	~	~	~	1
Canada Goose	~	~	~	~	~	~	~	1.66	~	~	0.25	~	2
Carolina Wren	~	~	~	0.05	0.07	0.08	~	~	~	~	~	~	3
Cedar Waxwing	~	~	~	~	~	0.40	0.13	~	~	~	~	~	2
Chipping Sparrow	~	~	~	~	~	~	~	~	~	0.15	~	~	1
Clapper Rail[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Common Grackle	~	0.18	0.40	0.05	0.20	1.99	1.07	0.12	0.47	~	0.49	~	9
Common Loon	~	~	~	~	~	~	~	~	~	~	~	0.22	1
Common Merganser	~	~	~	~	~	~	~	~	~	~	~	0.11	1
Common Tern	~	0.38	~	~	~	~	~	0.12	~	~	3.46	0.06	4

[2] Key = OW-O = ocean, INT-O = beach, HRB = herbaceous, HSS = herbaceous/shrub, SS = shrub, FOR = forest, FSS = forest/shrub, SM = saltmarsh, PH = *Phragmites* , PHS = *Phragmites* /shrub, INT-B = bayside intertidal flats, OW-B = bay.

	Community Types[2]												
Common Name	**OW-O**	**INT-O**	**HRB**	**HSS**	**SS**	**FOR**	**FSS**	**SM**	**PH**	**PHS**	**INT-B**	**OW-B**	**Number of Habitats Used**
Common Yellowthroat	~	~	0.10	1.70	2.02	0.16	2.24	~	2.35	2.39	~	~	7
Chestnut-sided Warbler	~	~	~	~	0.10	0.24	~	~	~	~	~	~	2
Double-crested Cormorant	~	~	~	~	~	~	~	~	~	~	~	0.06	1
Downy Woodpecker	~	~	~	~	~	0.24	0.10	~	~	~	~	~	2
Dunlin	~	0.47	~	~	~	~	~	~	~	~	4.45	~	2
Eastern Kingbird	~	0.02	0.03	0.10	0.10	0.24	0.07	~	~	0.08	~	~	7
European Starling	~	0.14	0.44	~	~	~	~	~	~	~	0.37	~	3
Eastern Wood-Pewee	~	~	~	~	~	0.08	~	~	~	~	~	~	1
Fish Crow	~	0.02	~	~	~	0.08	0.07	~	~	~	~	~	3
Fox Sparrow	~	~	~	~	0.07	~	~	~	~	~	~	~	1
Forster's Tern[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Gadwall	~	~	~	~	~	~	~	~	~	~	~	0.28	1
Great Black-backed Gull	~	1.15	~	~	~	~	~	~	~	~	1.61	0.66	3
Great Blue Heron	~	~	~	~	~	~	0.03	~	~	~	~	~	1
Golden-crowned Kinglet	~	~	0.07	0.15	0.46	0.56	1.44	~	~	0.08	~	~	6
Glossy Ibis	~	~	~	~	~	~	~	0.12	~	~	~	~	1
Gray Catbird	~	~	0.07	1.75	3.06	4.22	5.82	~	0.47	0.93	0.25	~	8
Great Egret	~	~	~	~	0.03	~	0.03	0.24	~	0.08	0.62	~	5
Green Heron[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Grasshopper Sparrow	~	~	0.07	~	~	~	~	~	~	~	~	~	1
Greater Yellowlegs	~	~	~	~	~	~	~	0.36	~	~	1.24	~	2
Herring Gull	~	0.93	0.07	~	~	~	~	0.12	~	~	4.20	1.44	6
Hermit Thrush	~	~	~	~	~	0.08	~	~	~	~	0.25	~	2
House Finch	~	~	~	~	0.13	0.24	0.20	~	~	0.15	~	~	4
Horned Lark	~	~	0.70	~	~	~	~	~	~	~	~	~	1
House Sparrow	~	~	~	~	0.07	~	~	~	~	~	~	~	1
Killdeer	~	~	~	~	0.03	~	~	~	~	~	~	~	1
Laughing Gull[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Little Blue Heron[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Least Flycatcher	~	~	~	~	0.03	0.08	~	~	~	~	~	~	2
Least Sandpiper	~	~	~	~	~	~	~	1.54	~	~	0.37	~	2
Least Tern	~	1.78	~	~	~	~	~	~	~	~	0.25	~	2
Lesser Yellowlegs	~	~	~	~	~	~	~	~	~	~	0.12	~	1
Mallard	~	0.04	0.17	0.24	0.07	~	0.03	1.42	~	~	0.49	1.05	8
Magnolia Warbler	~	~	~	0.10	0.07	0.32	0.07	~	~	~	~	~	4
Marsh Wren	~	~	~	0.05	~	~	~	~	~	~	~	~	1
Mourning Dove	~	~	0.20	0.73	0.78	1.43	0.94	0.12	~	~	~	~	6
Nashville Warbler	~	~	~	~	~	0.08	~	~	~	~	~	~	1

[2] Key = OW-O = ocean, INT-O = beach, HRB = herbaceous, HSS = herbaceous/shrub, SS = shrub, FOR = forest, FSS = forest/shrub, SM = saltmarsh, PH = *Phragmites* , PHS = *Phragmites* /shrub, INT-B = bayside intertidal flats, OW-B = bay.

	Community Types[2]												
Common Name	**OW-O**	**INT-O**	**HRB**	**HSS**	**SS**	**FOR**	**FSS**	**SM**	**PH**	**PHS**	**INT-B**	**OW-B**	**Number of Habitats Used**
Northern Bobwhite[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Northern Cardinal	~	~	~	0.05	0.29	0.40	0.33	~	~	0.62	~	~	5
Northern Flicker	~	~	0.03	0.05	0.20	0.32	0.27	~	~	~	~	~	5
Northern Gannet[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Northern Harrier	~	~	0.03	0.05	~	0.08	~	~	~	~	~	~	3
Dark-eyed Junco	~	~	~	1.51	1.37	4.86	2.68	~	~	1.47	~	~	5
Northern Mockingbird	~	~	0.27	1.02	0.39	0.64	0.43	~	~	~	0.12	~	6
Northern Oriole	~	~	~	~	~	~	0.03	~	~	~	~	~	1
Northern Parula Warbler	~	~	~	~	0.16	0.24	~	~	~	~	~	~	2
Northern Waterthrush	~	~	~	~	~	0.08	~	~	~	~	~	~	1
Osprey	~	~	~	~	~	~	~	~	~	~	~	0.11	1
Ovenbird	~	~	~	~	0.03	0.08	0.07	~	~	~	~	~	3
Palm Warbler	~	~	~	~	0.07	0.16	0.03	~	~	0.08	~	~	4
Peregrine Falcon[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Piping Plover	~	0.87	0.07	~	~	~	~	~	~	~	~	~	2
Purple Martin[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Rose-breasted Grosbeak	~	~	~	~	0.03	~	~	~	~	~	~	~	1
Ring-billed Gull	~	0.14	~	~	~	~	~	~	~	~	0.99	0.22	3
Red-breasted Merganser	~	~	~	~	~	~	~	~	~	~	0.12	0.72	2
Red-breasted Nuthatch	~	~	~	~	~	0.16	0.10	~	~	~	~	~	2
Ruby-crowned Kinglet	~	~	~	0.15	0.26	0.24	0.33	~	~	~	~	~	4
Red Knot[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Ring-necked Pheasant	~	~	~	~	0.03	~	~	~	~	~	~	~	1
Rock Dove	~	0.02	~	~	~	~	~	~	~	~	0.25	~	2
Rufous-sided Towhee	~	0.02	~	2.09	3.65	2.31	3.65	~	~	0.23	1.98	~	7
Rusty Blackbird	~	0.14	~	~	~	~	~	~	~	0.08	~	~	2
Ruddy Turnstone	~	0.02	~	~	~	~	~	~	~	~	1.24	~	2
Red-winged Blackbird	~	0.12	0.77	1.80	1.53	1.43	1.37	0.95	18.31	10.11	1.24	~	10
Sanderling	~	1.29	~	~	~	~	~	~	~	~	3.59	~	2
Short-billed Dowitcher[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Semipalmated Plover	~	0.32	~	~	~	~	~	~	~	~	~	~	1
Semipalmated Sandpiper[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Seaside Sparrow	~	~	~	~	~	~	~	1.07	~	0.08	~	~	2
Sharp-tailed Sparrow	~	~	0.47	~	~	~	~	1.54	~	0.08	~	~	3
Snowy Egret	~	~	~	~	~	~	~	0.24	~	~	0.12	~	2
Solitary Sandpiper	~	~	~	~	~	~	~	0.12	~	~	~	~	1

[2] Key = OW-O = ocean, INT-O = beach, HRB = herbaceous, HSS = herbaceous/shrub, SS = shrub, FOR = forest, FSS = forest/shrub, SM = saltmarsh, PH = *Phragmites*, PHS = *Phragmites*/shrub, INT-B = bayside intertidal flats, OW-B = bay.

	Community Types[2]												
Common Name	**OW-O**	**INT-O**	**HRB**	**HSS**	**SS**	**FOR**	**FSS**	**SM**	**PH**	**PHS**	**INT-B**	**OW-B**	**Number of Habitats Used**
Song Sparrow	~	0.04	4.46	6.86	2.31	0.56	1.81	0.12	2.82	3.63	~	~	9
Solitary Vireo	~	~	~	0.05	~	~	0.03	~	~	~	~	~	2
Spotted Sandpiper	~	~	~	~	~	~	~	~	~	~	1.11	~	1
Sharp-shinned Hawk	~	~	~	~	~	~	0.03	~	~	~	~	~	1
Surf Scoter[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Swamp Sparrow	~	~	~	~	~	~	0.03	~	~	~	0.12	~	2
American Tree Sparrow	~	~	0.10	0.05	0.07	~	~	~	~	~	~	~	3
Tree Swallow	~	~	~	~	0.07	~	~	~	~	~	~	~	1
Western Sandpiper[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Whimbrel[1]	~	~	~	~	~	~	~	~	~	~	~	~	0
Willow Flycatcher	~	~	~	~	0.13	~	0.17	~	0.47	0.08	~	~	4
Willet	~	0.10	0.10	0.05	~	~	0.03	2.73	~	~	1.98	0.06	7
Wilson's Plover	~	~	~	~	~	~	~	~	~	~	0.12	~	1
Wilson's Warbler	~	~	~	~	0.10	0.08	~	~	~	~	~	~	2
Winter Wren	~	~	~	~	~	0.16	0.03	~	~	~	~	~	2
Whip-poor-will	~	~	~	~	~	~	0.07	~	~	~	~	~	1
White-throated Sparrow	~	~	~	~	0.07	0.24	1.07	~	~	0.15	~	~	4
Yellow Warbler	~	~	0.03	0.44	1.40	0.72	1.17	0.12	0.94	0.39	~	~	8
Yellow-rumped Warbler	~	~	0.34	6.72	9.49	2.79	2.17	~	~	5.87	~	~	6

[1] Not included in density calculations, observed outside of the transect or on USACE July/August surveys

[2] Key = OW-O = ocean, INT-O = beach, HRB = herbaceous, HSS = herbaceous/shrub, SS = shrub, FOR = forest, FSS = forest/shrub, SM = saltmarsh, PH = *Phragmites* , PHS = *Phragmites* /shrub, INT-B = bayside intertidal flats, OW-B = bay.

4.4 ENDANGERED, THREATENED AND SPECIAL CONCERN SPECIES

Sixteen state and/or Federally-listed Endangered, Threatened or Special Concern Species (T&E) were documented in the study area. Table 6 identifies these species and identifies the habitats in which these birds were observed. Four species were observed only during transect surveys, three species were documented only during observation counts or incidentally, and the remaining nine species were observed during both transect counts and observation/incidental sightings. Eight additional species are listed on the National Audubon Society's Watch List, including American woodcock, saltmarsh sharp-tailed sparrow, short-billed dowicher, American black duck, brant, American oystercatcher, whimbrel, and wood thrush (Audubon 2002a). These species are not provided legal protection under state or Federal endangered species regulations.

One American bittern, vesper sparrow and short-eared owl were observed on one occasion during the 1-year survey. One roseate tern and one grasshopper sparrow were documented during two separate survey events. All other T&E species listed below were documented on several survey events and had numerous individuals sighted.

Piping plover, common tern and least tern are habitat specialists that are known to breed within areas covered in this Study; areas that could potentially be directly impacted though flood protection Project activities. These areas include the intertidal and supratidal areas of the beach and the face of primary dunes. Piping plover, least, common and roseate terns were observed within the beach and/or primary dune area or as flyovers in the Study area. One piping plover was observed within a sandy inner island swale at the location of a breech of the primary dune (near Transects 12). The number of piping plover appears to have increased between 2002 and 2003 surveys years and nesting tern populations appear to have remained stable. In May and June of 2002 a mixed colony of nearly 100 common and least tern was documented on the beach/primary dune area of transect 19. The colony was again documented at this location during 2003 spring surveys. No obvious change in population size was noted. In 2002, piping plover pairs were recorded in the beach/primary dune areas at three transects (1, 18, and 19). Individual birds were also recorded near Transect 1, at Transects 15 and 17, and as flyovers. During 2003 surveys, pairs of piping plover were documented at six transects (2, 5, 12, 17, 18, and 19). Individual birds were also noted near transect 1, at Transect 3, and as flyovers. A banded roseate tern was observed at Transect 1 in 2003.

Table 6. State and/or Federally-listed Endangered, Threatened, and Special Concern Species.

Common Name	Scientific Name	Federal Status	State Status	Habitat[1]
Peregrine falcon	*Falco peregrinus*	-	Endangered	Herbaceous Herb/Shrub
Piping plover	*Charadrius melodus*	Threatened	Endangered	Beach/Dune
Roseate tern	*Sterna dougallii*	Endangered	Endangered	Beach/Dune
Short-eared owl	*Asio flammeus*	-	Endangered	Herbaceous
Common tern	*Sterna hirundo*	-	Threatened	Beach/Dune
Least tern	*Sterna albifrons*	-	Threatened	Beach/Dune
Northern harrier	*Circus cyaneus*	-	Threatened	Herbaceous Herb/Shrub
American bittern	*Botaurus lentiginosus*	-	Special Concern	Salt Marsh
Black skimmer	*Rynchops niger*	-	Special Concern	Intertidal areas
Common loon	*Gavia immer*	-	Special Concern	Open Water
Grasshopper sparrow	*Ammodramus savannarum*	-	Special Concern	Herbaceous
Horned lark	*Eremophila alpestris*	-	Special Concern	Herbaceous
Osprey	*Pandion haliaetus*	-	Special Concern	Open Water
Seaside sparrow	*Ammospiza maritima*	-	Special Concern	Salt Marsh Phrag/Scrub
Sharp-shinned hawk	*Accipiter striatus*	-	Special Concern	Forest/Shrub
Vesper sparrow	*Pooecetes gramineus*	-	Special Concern	Herb/Shrub

[1] Habitat species was most often observed in or foraging above as in the case of hawks and osprey.
Source: NYDEC 2003.

5.0 DISCUSSION

The barrier island located along the south shore of Long Island is a unique ecosystem and the location of one of only a few remaining maritime forests in eastern North America. The geographic location and relatively intact habitat features of the island play an important role for birds (many of them threatened or endangered) during annual migration, breeding, and wintering activities. As this study, and others, have documented, the island is used by hundreds of bird species and thousands of individual birds during annual seasonal activities (USFWS 1983, Sauer et al. 2001, Audubon 2002b, FIRE 2002, National Audubon 2002, NatureServe 2002, NPS 2002, NYDEC 2002). As natural areas are lost due to development and human uses of these areas, the few remaining undeveloped areas of the barrier island, such as those surveyed in this study, become increasingly important to wildlife species. The following section provides a discussion regarding species detections, habitat use, seasonal use, and Threatened and Endangered species observed on the south shore barrier island.

5.1 SPECIES DETECTIONS

Estimates of the number of bird species likely to occur on the barrier island vary. For example, research by the USFWS has identified 243 species of birds as likely to occur on the island; this Study identified 1612 species; surveys conducted by volunteers and staff of the Fire Island National Seashore have identified in excess of 300 species; and Breeding Bird Atlas Survey (BBS) data identifies 190 species as most likely to occur in the Project area (USFWS 1983, Sauer et al. 2001, NPS 2002, NYDEC 2002). Literally millions of individual birds, representing hundreds of species, may use habitats of the island at any given time during migration, breeding, and/or wintering activities in any given year. Annual fluctuations in bird populations, irregularities in migratory behavior, and human activities in the Study area are just a few examples of factors that can affect the species richness and densities that can be expected in barrier island habitats in any given year.

One hundred sixty-two (162) species were observed during this Study. However, this Study was designed as a survey and not an exhaustive absolute count which focused on areas and habitats most likely to be affected by proposed USACE projects. As such, the number of species and number of individuals observed is probably an underestimate of the number of species actually using habitats within the Study area. For example, hundreds of birds were observed, yet not tallied during the survey, because they quickly moved through habitats in the Study area in large flocks where accurate tallies and species identification were not possible. In addition, large flocks of waterbirds, wading birds, and gulls were observed in open water areas and on exposed sand bars and islands. These species were not clearly visible from the shoreline, flushed easily when approached, and were therefore not accurately tallied.

Common species that were expected to occur in the Study area, but were not documented during this Study (13 species), include nine species of wintering ducks and waterbirds, including great cormorant, pied-billed grebe, green-winged teal, American wigeon, redhead duck, ring-necked duck, American coot, canvasback, and ruddy duck (Appendix C). The lack of these species during winter sampling events can likely be attributed to the iced-over conditions of Great Bay,

Shinnecock Bay, and Moriches Bay whereby 80% of the bay area was covered with ice (see photo documentation in Appendix A). These species require open water during wintering and likely moved to more suitable areas located outside of the USACE survey area. In addition, access to available open water areas to conduct surveys was restricted due to the ice.

The most abundant species in the Study area, throughout all seasons, were the great black-backed gull and herring gull. Thousands of individuals of these species were recorded in and along open water bodies and as flyovers during transect counts, observation surveys, and incidentally while conducting surveys in the Study area. These results are consistent with findings of the 1982 USFWS avian survey on the barrier island in which the great black-backed, herring gull, and common tern were identified as the most common species observed during the 1982 breeding season (USFWS 1983). Population trend data for these species indicated that their populations have been increasing. North American Breeding Bird Atlas (BBS) trend analysis for New York indicates an increase in number of 4.9% (P = 0.40) per year for herring gull, and 124.3% (P = 0.20) per year for great black-backed gull from 1980-2002 (Sauer et al. 2001).

5.2 SEASONAL USE

Approximately twenty-nine (29) percent of the birds observed during the Study are resident species that were observed repeatedly throughout all monthly survey events (Appendix C). Some of the most common resident species include herring and great black-back gulls, American crow, American robin, gray catbird, northern mockingbird, European starling, rufous-sided towhee, red-winged blackbird, song sparrow, and common grackle. Not surprisingly, these species were the most commonly observed species overall because they were observed on nearly every monthly survey event throughout the course of the Study. The most common species observed in each season and the habitats used are consistent with findings reported by USFWS 1983, Carroll 1986, Audubon 2002b, and NYDEC 2002, for the general Project area.

Migration

The migration seasons (i.e., spring, fall) are a time of transition from/to breeding or wintering grounds for approximately 39% of the birds observed during the Study. This was evident by the numbers of large flocks of birds observed flying over the Study area during spring and fall survey activities. Fifty-six (56) percent of all individuals observed during fall transect surveys were flyovers and 43% of all spring observations were flyovers. This number does not include the flocks of numerous species and hundreds of individuals observed flying over the area from observations surveys and incidental sightings. However, while a significant number of birds were observed flying over the area during migration, many were also documented in habitats of the Study area. While migrating, these communities provide important habitat for protection, resting, and foraging. Intertidal beach and bay areas were the most used habitats during spring migration and forest/shrub and shrub habitats were the most used habitats during fall migration.

Breeding

Thirteen (13) percent of the species observed in this study were species known to breed on the barrier island. Confirmed breeding pairs were observed using all habitats surveyed. However,

shorebirds, gulls, and terns observed using the intertidal areas of the ocean and bays made up a significant portion of the most common birds observed in the study area during the breeding season. Of the commonly observed species, only the terns were actually using the habitat for breeding purposes. The other species were resting or foraging in this habitat. For confirmed breeding birds, the forest and shrub habitats were the most used habitats. The most common speices using these habitats were breeding songbirds including rufous-sided towhee, gray catbird, and song sparrow. Phragmites/shrub habitat was used extensively for breeding purposes by red-winged blackbirds, another very common breeding bird in the Study area.

Wintering

Approximately 19% of the birds observed during the Study are wintering species. As expected, northern junco and yellow-rumped warbler were the most common winter birds observed using vegetated habitats within the Study area. These species are well-documented abundant winter residents in the Project area (USFWS 1983, Audubon 2002b, NYDEC 2002). In addition, other very common species observed in the open water communities (i.e., ocean and bay) include vast numbers of waterbirds. Shinnecock, Great South, and Moriches bays are one of the most significant wintering areas for waterbirds on the east coast (Audubon 2002b). Despite the high number of species and individuals reported from this Study, the numbers of wintering waterbirds in the Study area were likely lower than might be expected due to ice-over conditions of the bays in the Study area in December and January. Wintering waterbirds require open water and likely relocated to areas with more available open water during this time.

5.3 HABITAT USE

Bayside intertidal flats had the highest species diversity and abundance in the Study area. Waterbirds, shorebirds, and gulls utilized the narrow bayside flats, which were on average approximately 10 feet in width. Large numbers of birds were typically not observed in this community relative to other communities. However, given the limited amount of intertidal flat habitat included in transect surveys, bird use was relatively high in comparison to other community types. Species most often observed in the intertidal flat habitat include black-bellied plover, common tern, dunlin, herring gull, and sanderling, which used the area for foraging activities. Individuals from these species made up over 50% of the birds observed in this habitat.

The lowest species diversity and abundance was recorded for the near shore open ocean. Four herring gulls were recorded within transects surveys of the open ocean. Although, hundreds of birds were observed on or flying over the open ocean during surveys, most of these were well outside of the near shore area. Typically the seabirds and waterbirds most often found in the open ocean do not often use near shore areas. Some notable observations of these species offshore and outside of the transect area include rafts of several hundred scoter species, migrating flocks of several hundred cormorants, hundreds of terns and gulls flying and foraging over the near shore areas of the ocean, and groups of several hundred northern gannett that were observed foraging offshore.

Approximately half of the species observed during this Study were found in large numbers and in a wide diversity of community types (Table 5). These species are typically considered to be

"generalists" who are adapted to utilize a wide diversity of habitats and who typically have relatively stable population numbers. The habitat requirements for most of these species is so diverse that they are quickly able to adapt to changes in the availability of one community type by using another suitable habitat nearby. Region-wide, many of generalist species, such as European starling, American crow, blue jay, common grackle, house finch, house sparrow, brown-headed cowbird, numbers are on the increase and are believed to be out-competing other species that are less able to adapt to habitat losses and pressure from development and human activities (Erlich et al., 1988, TNC 1999, Sauer et al., 2001, NatureServe 2002). There is growing concern that these species are out-competing some habitat specific and/or disturbance sensitive species.

In comparison, a significant number of species were documented using two or fewer community types (Table 5). Many of these include species that are considered "specialists"; species that have very specific habitat requirements. For example, piping plovers require supratidal beach areas and dunes with specific micro-habitat features for breeding and nesting purposes. Species with low densities and found in two or fewer habitats are typically considered "specialist" species in that numerous individuals were repeatedly documented using only one or two specific habitats (Table 5). Specialist species are of growing concern as humans place higher demands on the remaining undeveloped natural communities. Unlike generalists, who can utilize a wide diversity of habitats, these species are not adapted to utilize other habitats should their preferred habitat not be available.

Numerous species in the list of those observed in two or fewer communities are not considered specialist. Habitat use is underestimated in these cases due to few observations of the species in the Study area. For example, many of the migratory warblers are known to use a diversity of habitat types. However, observations of these species was limited as they landed briefly in a habitat, foraged, and continued on their migration. Limited sightings of a species in one habitat are useful in confirming the use of the island by a given species. However, it is not an accurate representation of the overall number of habitat types preferred by the species.

5.4 ENDANGERED, THREATENED AND SPECIAL CONCERN SPECIES

Sixteen endangered, threatened, or special concern species were identified during sampling activities (Table 6). Although these species may utilize a diversity of community types throughout their life cycle, most are dependant upon very specific habitats and/or habitat features for their survival and productivity. Four of the T&E species are dependant on intertidal, supratidal, and dune communities (piping plover, roseate tern, common tern, least tern), three are dependant on marsh communities (American bittern, black skimmer, common loon), four are considered inhabitants of grassland/low growing herb communities (grasshopper sparrow, vesper sparrow, seaside sparrow, horned lark), and five are considered birds of prey (peregrine falcon, short-eared owl, osprey, northern harrier, sharp-shinned hawk). The habitat requirements for birds of prey are diverse, but each often requires large, un-fragmented tracts of habitat with an abundance of prey, for breeding and/or foraging purposes.

Suitable habitat currently exists in the Study area for T&E species known to breed on the barrier island including black skimmer, common tern, least tern, piping plover, grasshopper sparrow,

seaside sparrow, and horned lark. In fact, breeding pairs of each of these species was confirmed during the 2002-2003 Study. Four of the T&E species known to breed in the Study area are dependant upon intertidal, supratidal, and primary dune habitats. Measures have been taken by local, state, and Federal agencies to restrict access by humans to known breeding areas in the Project area. Bird surveys conducted by the Audubon Society confirmed 7 pair of piping plovers, 1207 pair of common terns, and 67 pairs of least terns breeding within Fire Island National Park in 1996 (Audubon 2002b).

With one exception, the remaining T&E species are not expected to breed within the barrier island Project area. The exception is the osprey, which has been identified as a rare to uncommon fall migrant on the barrier island (USFWS 1983). However, this Study has confirmed at least three active breeding pairs utilizing man-made nest platforms. Active nest sites were located adjacent to salt marshes and near large bodies of open water in the study area. Observations during this Study have confirmed that these pairs successfully bred and fledged chicks in the 2002 and 2003 breeding seasons. Populations trends for osprey have been increasing in the northeast primarily due to bans on the pesticide DDT and habitat improvement projects that include successful use of artificial nest platforms such as those observed in this Study (Sauer et al., 2001, NatureServe 2002).

The island ecosystem plays an important role even for the T&E species that are not expected to use the island for breeding purposes. These species include a significant number of hawks and raptors, including peregrine falcon, northern harrier, and sharp-shinned hawk, that forage and rest on the island during migration, and the short-eared owl that often winters in the Study area. The short-eared owl was observed only once in the Study area. However, Peregrine falcon, northern harrier, and sharp-shinned hawk were observed on numerous occasions during this Study. Hawk surveys have been conducted during fall migration on the barrier island since the early 1980's. Results from the 2001 survey confirmed that 12 species, comprised of 3,694 individuals, of hawks and raptors use the barrier island during migration. Species observed include osprey, bald eagle, northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, red-tailed hawk, brag winged hawk, American kestrel, merlin, and peregrine falcon (FIRE 2002). Thirty-two (32) percent of birds recorded during raptor surveys included the T&E peregrine falcon, northern harrier, and sharp-shinned hawk. According to USFWS, Northern harrier are designated as fall migrants in the Study area (USFWS 1983). However significant numbers of harriers were documented during the breeding season by this Study. Harriers were observed foraging above open areas and herbaceous communities. Breeding status was not confirmed.

6.0 IMPLICATIONS FOR PLAN FORMULATION

Beaches and dunes are dynamic systems whereby sand and sediments are under the influence of waves, tides, currents and winds that may move sand onshore, offshore, or along the shoreline, depending on the combination of these elements at work at any given time. Studies conducted on Fire Island have documented extensive beach widening in some areas along the island and narrowing in others (Taney 1961, Bokuniewicz et al. 1988, Zimmerman et al. 1989). For example, studies conducted on East Hampton Beach since 1979 have shown that in 1988 the average beach width was 90 feet wider than documented in 1979 (Bokuniewicz et al. 1988, Zimmerman et al. 1989). While the average width has increased, some sections of the beach were significantly narrower than previously documented. The changes from month to month in beach width can be significant. The studies of East Hampton Beach found that beach width varied from 26 feet to 188 feet over a 1-year period (Bokuniewicz et al. 1988, Zimmerman et al. 1989).

In this dynamic system, occasional breaching of the protective primary dune occurs when forces deteriorate the beach and primary dune and water is able to cross over the island and into the bay. The most dramatic result can be extreme flooding of areas located adjacent to the bay. Breeching of the primary dune was observed at the start of this Study in a location just east of Transect 12. Approximately 100 feet of primary dune was eliminated and a large sandy swale with small ephemeral pools was observed across most of the island at this location. In addition, following significant storm events in April 2003, the primary dune located just east of the original breech site was reduced from 10 feet in height to several feet. The USACE Fire Island reformulation project is investigating the feasibility of beach re-nourishment as one alternative for flood control in areas along the barrier island such as these that exhibit high potential for beach/dune erosion and potential breaching. This activity would involve depositing sand on the existing beach to increase beach width and sand volume. Other alternatives have yet to be determined, but would presumably involve impacts only to near shore, beach, and/or dune areas.

Negative impacts typically associated with beach re-nourishment and similar flood control alternatives, can include short-term impacts to wildlife such as disturbance to fish, benthic communities, birds and mammals due to noise and activities associated with construction along the beach. Some direct mortality can be expected in the benthic communities and to herpetiles with limited mobility. However, studies conducted in Raritan Bay, NJ, by the USACE, have shown that following beach re-nourishment activities benthic and bird communities using the near shore open water, beach, and primary dune areas return to pre-construction levels within a 1-year period (Burlas 2001). Birds are mobile species that can be expected to flee the impact area during construction activities and return within a relatively short period, so long as activities are scheduled to avoid breeding, spawning, and nesting activities. Some habitat impacts that may disrupt normal breeding, nesting, or spawning activities are likely to occur as potentially suitable areas are covered with additional volumes of sand.

Beach re-nourishment activities are expected to impact only the near shore ocean, intertidal, supratidal, and primary dune communities surveyed during this study. As such, species

dependant on these habitats for foraging, breeding, spawning, and/or nesting activities could potentially experience some impacts from the Project. These impacts may be positive and or negative depending on the species and timing of construction activities. Table 7 identifies 47 avian species with strong habitat associations to the communities likely to be impacted by beach re-nourishment, or similar, flood protection activities. The table includes some species, not documented during this study, but that have a high likelihood of occurring in the communities likely to be impacted during flood protection activities. Although additional species are known to use the communities likely to be impacted, the table includes only those species dependant upon this community type for foraging, breeding, and/or nesting activities. Species excluded from Table 7 include those species that were recorded in relatively high numbers in other communities within the Study area and that have no documented preference for near shore ocean, beach, and/or dune communities (Peterson 1980, Bull 1985, DeGraff and Rudis 1986, Stokes 1996, Sibley 2000, NatureServe 2002).

The species that depend upon the beach/dune community for foraging, breeding, and nesting are most susceptible to impacts from beach re-nourishment, or similar, flood protection activities. These species are underlined in Table 7. However, if project activities are scheduled to avoid breeding and nesting seasons and avoid impacts to existing breeding and nesting areas, these species may benefit from beach re-nourishment in that the activity may provide additional suitable foraging, breeding, and nesting habitat and provide additional protection to existing areas. Research by the USACE in coastal areas of New Jersey found that the number of breeding pairs of piping plover, least tern, and common tern increased following beach re-nourishment activities (Burlas 2001).

Species documented on Fire Island, and not strongly linked to the beach/dune communities, may exhibit some avoidance to the Project area during construction activities due to the noise and human activity. This includes approximately 111 of the 158 species documented during this study. However, the avoidance is not likely to cause significant negative impacts to the species because they are not dependant upon beach/dune communities for foraging, breeding, and/or nesting. Ongoing activities not associated with beach re-nourishment, such as loss of habitat, encroachment by humans, and increases in human activities within preferred foraging, breeding, and/or nesting areas, are the leading threats to these species.

Table 7. Species Use of Beach and Dune Communities of the Barrier Island.

Common Name	Scientific Name	Primary Use of Beach/Dune Community
Black-bellied Plover	*Pluvialis squatarola*	Foraging during winter and migration
American Golden Plover[1]	*Pluvialis dominica*	Foraging during migration
Semipalmated Plover	*Charadrius semipalmatus*	Foraging during migration
Piping Plover	*Charadrius melodus*	Foraging, breeding, nesting in summer
Killdeer	*Charadrius vociferus*	Foraging, breeding, nesting in summer
American Oystercatcher	*Haematopus palliatus*	Foraging, breeding, nesting in summer
Greater Yellowlegs	*Tringa melanoleuca*	Foraging during winter and migration
Lesser Yellowlegs	*Tringa flavipes*	Foraging during migration
Solitary Sandpiper	*Tringa solitaria*	Foraging during migration
Spotted Sandpiper	*Actitis macularia*	Foraging in summer
Willet	*Catoptrophorus semipalmatus*	Foraging in summer
Whimbrel	*Nemenius phaeopus*	Foraging during migration
Ruddy Turnstone	*Arenaria interpres*	Foraging during winter and migration
Red Knot	*Calidris canutus*	Foraging during winter and migration
Hudsonian Godwit[1]	*Limosa haemastica*	Foraging during migration
Marbled Godwit[1]	*Limosa fedoa*	Foraging during migration
Sanderling	*Calidris alba*	Foraging during winter and migration
Semipalmated Sandpiper	*Calidris pusilla*	Foraging during migration
Western Sandpiper	*Calidris mauri*	Foraging during migration
Least Sandpiper	*Calidris minutilla*	Foraging during migration
White-rumped Sandpiper[1]	*Calidris fuscicollis*	Foraging during migration
Pectoral Sandpiper[1]	*Calidris melanotos*	Foraging during migration
Purple Sandpiper[1]	*Calidris maritima*	Foraging during winter and migration
Dunlin	*Calidris alpina*	Foraging during winter and migration
Stilt Sandpiper[1]	*Micropalama himantopus*	Foraging during migration
Short-billed Dowitcher [1]	*Limnodromus griseus*	Foraging during migration
Long-billed Dowitcher[1]	*Limnodromus scolopaceus*	Winter foraging (rare occurrence)
Long-billed Curlew	*Nemenius americanus*	Winter foraging (rare occurrence)
Laughing Gull[1]	*Larus atricilla*	Summer foraging
Herring Gull	*Larus argentatus*	Year round foraging
Iceland Gull[1]	*Larus glaucoides*	Winter foraging (rare occurrence)

Table 7. Species Dependant Upon Beach and Dune Communities of the Barrier Island (continued).

Common Name	Scientific Name	Primary Use of Beach/Dune Community
Lesser Black-backed Gull[1]	*Larus fuscus*	Winter foraging (rare occurrence)
Glaucous Gull[1]	*Larus hyperboreus*	Winter foraging (rare occurrence)
Great Black-backed Gull	*Larus marinus*	Year round foraging
Caspian Tern[1]	*Sterna caspia*	Foraging during migration
Royal Tern[1]	*Sterna maxima*	Foraging, breeding, nesting
Roseate Tern	*Sterna dougallii*	Foraging, breeding, nesting
Common Tern	*Sterna hirundo*	Foraging, breeding, nesting
Forster's Tern	*Sterna forsteri*	Foraging, breeding, nesting
Least Tern	*Sterna albifrons*	Foraging, breeding, nesting
Black Skimmer	*Rynchops niger*	Foraging, breeding, nesting
Black-legged Kittiwake[1]	*Rissa tridactyla*	Winter foraging (rare occurrence)
Ring-billed Gull	*Larus delawarensis*	Foraging during winter and migration
Black-headed Gull[1]	*Larus ridibundus*	Winter foraging (rare occurrence)
Boneparte's Gull	*Larus philadelphia*	Foraging during winter and migration
Little Gull[1]	*Larus minutus*	Foraging during winter and migration
Horned Lark	*Eremophila alpestris*	Foraging, breeding, nesting

[1] Species likely to depend on beach/dune communities on Fire Island, but not documented during 2002-2003 avian surveys.

7.0 LITERATURE CITED

Audubon. 2002a. Audubon Society Species Watch List. Available: http://www.audubon.org/bird/watchlist/bs-bc-search.html. Accessed July 2003.

Audubon. 2002b. Audubon Society of New York State: Important Bird Areas. Available: http://www.audubon.org/chapter/ny/ny/iba/index.html. Accessed July 2003.

Birdnet: The Ornithological Information Source. Available: http://www.nmnh.si.edu/BIRDNET/index.html. Accessed July 2003.

Bokuniewicz, H.J., M.S. Zimmermanm B. Pavlik and R. Zimmer. 1988. Beach Regimen of the Beach at east Hampton, New York. Technical Report of the Marine Sciences Research Center, State University of New York at Stony Brook. 20 pp.

Bull, J. 1985. The Birds of New York State. American Museum of Natural History, Cornell University Press, Ithica, New York. 703 pp.

Burlas, Mark H. 2001. The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project.

Carroll, J.R. 1986. Adequate coverage: New York Breeding Bird Atlas. Pp. 16-17 in Sutcliffe, S.M., R.E. Bonney, Jr., and J.D. Lowe, Proc. Second Northeastern Breeding Bird Atlas Conf., Lab. of Ornithology, Ithaca, NY.

DeGraaf, R.M. and D.D. Rudis. 1986. New England Wildlife: Habitat, Natural History, and Distribution. United States Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 491 pp.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The birder's handbook. Simon & Schuster, New York. 785 pp.

Fire Island Raptor Enumerators (FIRE). 2002. Fire Island Hawk Watch Results. Available: http://www.battaly.com/fire/. Accessed July 2003.

National Audubon Society. (2002). The Christmas Bird Count Historical Results. Available http://www.audubon.org/bird/cbc. Accessed July 2003.

National Park Service (NPS). 2002. NPS Research and Reporting System - Fire Island National Seashore (FINS). Available: http://science.nature.nps.gov/. Accessed June 2003.

NatureServe. 2002 NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.6. Arlington, Virginia. Available: http://www.natureserve.org/explorer. Accessed July 2003.

New York Department of Environmental Conservation (NYDEC). 2003. List of Endangered, Threatened, and Special Concern Fish and Wildlife Species of New York State. Available at http://www.dec.state.ny.us/website/dfwmr/wildlfie/endspecies/etsclist.html, last updated March 6, 2003. Accessed July 2003.

New York Department of Environmental Conservation (NYDEC). 2002. New York Breeding Bird Atlas Program. Available: http://www.dec.state.ny.us/website/dfwmr/wildlife/bba/. Accessed June 2003.

Peterson, R.T. 1980. A Field Guide to the Birds: A Completely New Guide to All Birds of Eastern and Central North America. Houghton Mifflin Co., Boston, MA. 384 pp.

Raynor, G. 1982. Evaluation of breeding bird atlas survey data. Pp. 66-69 in Laughlin, S.B., ed. Proc. Northeastern Breeding Bird Atlas Conf., Vermont Inst. Nat. Sci., Woodstock, VT. 122 pp.

Sauer, J. R., J. E. Hines, and J. Fallon. 2001. The North American Breeding Bird Survey, Results and Analysis 1966 - 2000. Version 2001.2. USGS Patuxent Wildlife Research Center, Laurel, Maryland. Available: http://www.mbr-pwrc.usgs.gov/bbs/bbs2001.html. Accessed July 2003.

Stokes, D.W. and L.Q. Stokes. 1996a. Stokes Field Guide to Birds: Eastern Region. Little, Brown & Company, Boston, MA. 417 pp.

Stokes, D.W. and L.Q. Stokes. 1996b. Stokes Audio Guide to Birds: Eastern Region, 4 compact disk set.

Sibley, D.A. 2000. National Audubon Society: The Sibley Guide to Birds. Alfred A. Knopf, Inc. New York, NY. 545 pp.

Taney, N.E. 1961. Geomorphology of the south shore of Long Island, New York. Department of the Army, Beach Erosion Board, U.S. Corps of Engineers. Technical Memorandum, No. 128. 51 pp.

The Nature Conservancy (TNC). 1999. Species Management Abstracts: Wings of the Americas Program. Available: http://www.partnersinflight.org/birdacct.htm. Accessed July 2003.

U.S. Fish and Wildlife Service (USFWS). 1982. Fish and Wildlife Resource Studies for the Fire Island Inlet to Montauk Point, New York, Beach Erosion Control and Hurricane Protection Project Reformulation Study. U.S. Department of the Interior, Fish and Wildlife Service, Region 5, Cortland Office, Cortland, NY.112 pp.

U.S. Geologic Survey (USGS). 2003a. Breeding Bird Survey Program Bird Distribution Maps (Breeding and Wintering). Available: http://www.mbr-pwrc.usgs.gov/bbs/htm96/map617/all.html.

Zimmerman, M.S., H.J. Bokuniewicz, and L. McTiernan. 1989. Beach Conditions at East Hampton, New York, January Through December 1988. Technical Report of the Marine Sciences Research Center, State University of New York at Stony Brook. 41 pp.

Appendix A

Photographic Documentation

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: May 2002
Direction: E

Comments:
Oceanside face of primary dune and supratidal area of beach. Note the sparse herbaceous cover of American beach grass (*Ammophila breviligulata*) on dune face and shrub vegetation on tops of dune.

Photographer: S. Grove
Date: June 2002
Direction: S

Comments:
Near shore open ocean, beach (including intertidal and supratidal areas of the beach), and herbaceous beach grass communities.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: May 2002
Direction: E

Comments:
Top of primary dune, covered with beach grass. The open ocean and beach communities are visible to the right of the dune and the herbaceous and herbaceous/shrub communities are visible to the left.

Photographer: S. Grove
Date: May 2002
Direction: E

Comments:
Back side of primary dune. Note the herbaceous/shrub community in the photo foreground.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: May 2002
Direction: N

Comments:
Herbaceous/scrub-shrub community. The stunted forest community located along the bay shoreline is visible in the photo center/rear.

Photographer: S. Grove
Date: May 2002
Direction: N

Comments:
Herbaceous/shrub community typical of the inner-island. The stunted forest commu nity is visible in the background.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: June 2002
Direction: S

Comments:
Herbaceous community located on protected side of primary dune. Scattered, stunted shrubs are located on the top of the dune.

Photographer: S. Grove
Date: September 2002
Direction: N

Comments:
Herbaceous community.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: May 2002
Direction: S

Comments:
Stunted hardwood forest community.

Photographer: S. Grove
Date: May 2002
Direction: N

Comments:
Stunted conifer forest community.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District
Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: June 2002
Direction: N

Comments:
Forest/shrub community.

Photographer: S. Grove
Date: June 2002
Direction: NW

Comments:
Forest/shrub community with a significant herbaceous component.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: May 2002
Direction: N

Comments:
Shrub community.

Photographer: S. Grove
Date: June 2002
Direction: NE

Comments:
Shrub community located on secondary dunes of the inner-island area.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove

Date: April 2003

Direction: S

Comments:

Salt marsh community. Note the fringes of *Phragmites* and *Phragmites*/shrub communities surrounding the salt marsh.

Photographer: S. Grove

Date: March 2003

Direction: SE

Comments:

Secondary dune located on bayside of island.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: May 2003
Direction: E

Comments:
Transition zone from bayside intertidal area into stunted forest/shrub community.

Photographer: S. Grove
Date: March 2003
Direction: W

Comments:
Nears shore area of bay and bayside intertidal flats.

NORTHERN ECOLOGICAL ASSOCIATES, INC.

PHOTOGRAPHIC RECORD

Company: USACE - New York District

Project: Reformulation of the Shore Protection and Storm Damage Reduction Project for the South Shore of Long Island, New York

Photographer: S. Grove
Date: December 2002
Direction: SW

Comments:
Snow in herbaceous/shrub community.

Photographer: S. Grove
Date: January 2003
Direction: N
Comments:
Ice Buildup along shoreline of the Great South Bay. Approximately 80% of Great South, Shinnecock, and Moriches bays were ice covered during January surveys.

Appendix B

Field Notes

Appendix C

Avian Species List

Appendix C. Bird Species of the south shore of Long Island, NY.

Common Name	Scientific Name		Likely to Occur	Documented by USFWS 1982	Documented by NEA/USACE 2003	Seasonal Abundance[1]	Seasonal Use[2]
Gavidae							
Red-throated Loon	*Gavia stellata*		1		1	C	M, WR
Common Loon	*Gavia immer*		1		1	C	M, WR
Podicipedidae							
Horned Grebe	*Podiceps auritus*		1		1	C	WR
Red-necked Grebe	*Podiceps grisegena*		1		1	U	WR
Pied-billed Grebe	*Podilymbus podiceps*		1			C	WR
Pelecaniformes							
Northern Gannet	*Morus banus*		1		1	C	WV
Great Cormorant	*Phalacrocorax carbo*		1			C	FM
Double-crested Cormorant	*Phalacrocorax auritus*		1		1	A	FM
Wading Birds							
American Bittern	*Botaurus lentiginosus*				1		
Great Blue Heron	*Ardea herodias*		1		1	C	SN, WR
Great Egret	*Casmerodius albus*		1		1	C	FM
Snowy Egret	*Egretta thula*		1		1	C	FM
Little Blue Heron	*Egretta caerulea*		1		1	U	FM
Green Heron	*Butorides striatus*		1	1	1	C	FM
Black-crowned Night-Heron	*Nycticorax cycticorax*		1		1	C	FM
Yellow-crownded Night-Heron	*Nycticorax violacea*		1			U	FM
Glossy Ibis	*Plegadis falcinellus*		1		1	C	FM
Swans, Geese, Ducks							
Tundra Swan	*Cygnus columbianus*		1			R	WV
Mute Swan	*Cygnus olor*	*	1		1	C	R
Snow Goose	*Chen caerulscens*		1		1	U	FM
Brant	*Branta bernicla*		1		1	C	WR
Canada Goose*	*Branta canadensis*		1	1	1	A	R
Wood Duck	*Aix sponsa*		1	1		U	FM
Green-winged Teal	*Anas crecca*		1			C	FM
American Black Duck	*Anas rubripes*		1	1	1	A	R
Mallard*	*Anas platyrhynchos*		1	1	1	C	R
Northern Pintail	*Anas acuta*		1		1	C	WR
Blue-winged Teal	*Anas dicors*		1			U	SM
Northern Shoveler	*Anas clypeata*		1			U	WR
Gadwall	*Anas strepera*		1	1	1	A	R
American Wigeon	*Anas americana*		1			C	WR
Canvasback	*Aytha valisineria*		1			C	WR
Redhead	*Aytha americana*		1			C	WR
Ring-necked Duck	*Aytha collaris*		1			U	WR
Greater Scaup	*Aytha marila*		1		1	A	WR
Lesser Scaup	*Aytha affinis*		1			U	FM
Common Eider	*Somateria mollissima*		1			U	WV
King Eider			1			R	WV
Harlequin Duck	*Histrionicus histrionicus*		1			R	WV
Long-tailed Duck (oldsquaw)	*Clangula hyemalis*		1		1	A	WR
Black Scoter	*Melanitta nigra*		1		1	C	WR
Surf Scoter	*Melanitta perspicillata*		1		1	C	WR
White-winged Scoter	*Melanitta fusca*		1		1	A	WR
Common Goldeneye	*Bucephala clangula*		1		1	A	WR
Barrow's Goldeneye	*Bucephala islandica*		1			R	WV
Bufflehead	*Bucephala albeola*		1		1	A	WR
Hooded Merganser	*Lophodytes cucullatus*		1			U	WR
Common Merganser	*Mergus merganser*		1		1	C	WV
Red-breasted Merganser	*Mergus serrator*		1		1	C	WR
Ruddy Duck	*Oxyura jamaicensis*		1			C	WR

Appendix C. Bird Species of the south shore of Long Island, NY.

Common Name	Scientific Name	Likely to Occur	Documented by USFWS 1982	Documented by NEA/USACE 2003	Seasonal Abundance[1]	Seasonal Use[2]
Diurnal Raptors						
Osprey	*Pandion haliaetus*	1		1	U	FM
Bald Eagle	*Haliaeetus leucocephalus*	1			R	WV
Northern Harrier	*Circus cyaneus*	1		1	A	FM
Sharp-shinned Hawk	*Accipiter striatus*	1		1	C	FM
Cooper's Hawk	*Accipiter cooperii*	1			R	FM
Red-tailed Hawk	*Buteo jamaicensis*	1			U	WR
Rough-legged Hawk	*Buteo lagopus*	1			R	WV
American Kestrel	*Falco sparverius*	1	1	1	A	R
Merlin	*Falco columbarius*	1		1	C	FM
Peregrine Falcon	*Falco peregrinus*	1		1	R	FM
Upland Game Birds						
Ring-necked Pheasant*	*Phasianus colchicus*	1	1	1	C	R
Northern Bobwhite*	*Colinus virginianus*	1	1	1	U	R
Gruiformes						
Clapper Rail*	*Rallus longirostris*	1		1	U	R
King Rail	*Rallus elegans*	1			R	WV
Virginia Rail*	*Rallus limicola*	1			R	R
American Coot*	*Fulica americana*	1			C	WR
Shorebirds						
Black-bellied Plover	*Pluvialis squatarola*	1		1	A	M
American Golden Plover	*Pluvialis dominica*	1			R	M
Semipalmated Plover	*Charadrius semipalmatus*	1		1	C	FM
Wilson's Plover	*Charadrius wilsonia*			1		
Piping Plover*	*Charadrius melodus*	1	1	1	C	FM
Killdeer*	*Charadrius vociferus*	1		1	U	FM
American Oystercatcher	*Haematopus palliatus*	1	1	1	C	FM
Greater Yellowlegs	*Tringa melanoleuca*	1		1	A	FM
Lesser Yellowlegs	*Tringa flavipes*	1		1	A	FM
Solitary Sandpiper	*Tringa solitaria*	1		1	U	M
Spotted Sandpiper*	*Actitis macularia*	1	1	1	U	FM
Willet*	*Catoptrophorus semipalmatus*	1	1	1	C	R
Whimbrel	*Nemenius phaeopus*	1		1	U	M
Ruddy Turnstone	*Arenaria interpres*	1		1	C	M
Red Knot	*Calidris canutus*	1		1	A	FM
Hudsonian Godwit	*Limosa haemastica*	1			U	M
Marbled Godwit	*Limosa fedoa*	1			U	FM
Sanderling	*Calidris alba*	1		1	A	FM
Semipalmated Sandpiper	*Calidris pusilla*	1		1	A	FM
Western Sandpiper	*Calidris mauri*	1		1	R	FM
Least Sandpiper	*Calidris minutilla*	1		1	A	FM
White-rumped Sandpiper	*Calidris fuscicollis*	1			R	M
Pectoral Sandpiper	*Calidris melanotos*	1			C	FM
Purple Sandpiper	*Calidris maritima*	1			R	WR
Dunlin	*Calidris alpina*	1		1	A	FM
Stilt Sandpiper	*Micropalama himantopus*	1			U	FM
Short-billed Dowitcher	*Limnodromus griseus*	1		1	C	M
Long-billed Dowitcher	*Limnodromus scolopaceus*	1			R	M
Common Snipe	*Capella gallinago*	1			R	FM
American Woodcock	*Philohela minor*	1		1	U	R
Long-billed Curlew	*Nemenius americanus*	1			R	FM
Gulls, Terns, Skimmers						
Laughing Gull	*Larus atricilla*	1		1	C	FM
Herring Gull	*Larus argentatus*	1	1	1	C	R
Iceland Gull	*Larus glaucoides*	1			R	WV
Lesser Black-backed Gull	*Larus fuscus*	1			R	WV
Glaucous Gull	*Larus hyperboreus*	1			R	WV

Appendix C. Bird Species of the south shore of Long Island, NY.

Common Name	Scientific Name	Likely to Occur	Documented by USFWS 1982	Documented by NEA/USACE 2003	Seasonal Abundance[1]	Seasonal Use[2]
Great Black-backed Gull	*Larus marinus*	1	1	1	C	R
Caspian Tern	*Sterna caspia*	1			U	FM
Royal Tern	*Sterna maxima*	1			R	FM
Roseate Tern	*Sterna dougallii*	1	1	1	R	SB, M
Common Tern*	*Sterna hirundo*	1	1	1	A	SB, M
Forster's Tern	*Sterna forsteri*			1	R	FM
Least Tern*	*Sterna albifrons*	1	1	1	C	SB, M
Black Skimmer	*Rynchops niger*	1	1	1	C	SB, FM
Black-legged Kittiwake	*Ri tridactyla*	1			U	WV
Ring-billed Gull	*Larus delawarensis*	1		1	C	M
Black-headed Gull	*Larus ridibundus*	1			R	WV
Boneparte's Gull	*Larus philadelphia*	1		1	A	WR
Little Gull	*Larus minutus*	1			R	WV
Alcids						
Dovekie		1			R	WV
Pigeons and Doves						
Rock Dove	*Columbia livia*	1		1	C	R
Mourning Dove	*Zenaida macroura*	1	1	1	A	R
Cuckoos						
Black-billed Cuckoo	*Coccyzus erythropthalmus*	1			R	M
Yellow-billed Cuckoo	*Coccyzus americanus*	1			R	M
Owls						
Barn Owl	*Tyto alba*	1			R	R
Eastern Screeh-Owl	*Otus asio*	1			C	R
Great Horned Owl	*Bubo virginianus*	1			U	R
Snowy Owl	*Nyctea scandiaca*	1			R	WV
Long-eared Owl	*Asio otus*	1			R	WR
Short-eared Owl	*Asio flammeus*	1		1	C	WR
Northern Saw-whet Owl	*Aegolius acadicus*	1			R	WV
Goatsuckers and Swifts						
Common Nighthawk	*Chordeiles minor*	1			U	SM
Whip-poor-will	*Caprimulgus vociferus*	1		1	U	SR
Chuck-will's-widow	*Caprimulgus carolinensis*	1		1	R	SR
Chimney Swift	*Chaetura pelagica*	1		1	U	SR
Hummingbirds						
Ruby-throated Hummingbird	*Archilochus colubris*	1			U	SR
Kingfishers						
Belted Kingfisher	*Megaceryle alcyon*	1		1	C	R
Woodpeckers						
Red-headed Woodpecker	*Melanerpes erythrocephalus*	1			U	FM
Yellow-bellied Sapsucker	*Sphyrapicus varius*	1			U	M
Downy Woodpecker	*Picoides pubescens*	1		1	C	R
Hairy Woodpecker	*Picoides villosus*	1			C	R
Northern Flicker	*Colaptes auratus*	1	1	1	A	R
Tyrant Flycatchers						
Eastern Wood-Pewee	*Contopus virens*	1		1	U	SR
Least Flycatcher	*Empidonax minimus*	1		1	U	SR
Eastern Phoebe	*Sayornis phoebe*	1			U	SR
Great Crested Flycatcher	*Myiarchus crinitus*	1		1	U	SR
Eastern Kingbird*	*Tyrannus tyrannus*	1	1	1	C	R
Willow Flycatcher	*Empidonax traillii*	1		1	R	SR

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Common Name	Scientific Name	Likely to Occur	Documented by USFWS 1982	Documented by NEA/USACE 2003	Seasonal Abundance[1]	Seasonal Use[2]
Larks						
Horned Lark	*Eremophila alpestris*	1	1	1	C	R
Swallows						
Purple Martin	*Progne subis*	1		1	U	FM
Tree Swallow	*Iridoprocne bicolor*	1	1	1	U	FM
Northern Rough-winged Swallow	*Stelgidopteryx ruficollis*	1			C	FM
Bank Swallow	*Riparia riparia*	1		1	A	FM
Barn Swallow	*Hirundo rustica*	1	1	1	C	FM
Jays and Crows						
Blue Jay	*Cyanocitta cristata*	1	1	1	A	R
American Crow	*Corvus brachyrhynchos*	1	1	1	C	R
Fish Crow	*Corvus ossifragus*	1	1	1	U	R
Chickadees						
Black-capped Chickadee	*Parus atricapillus*	1	1	1	C	R
Nuthatches and Creepers						
Tufted Titmouse	*Parus bicolor*	1		1	C	R
Red-breasted Nuthatch	*Sitta canadensis*	1		1	C	WR
White-breasted Nuthatch	*Sitta carolinensis*	1			C	R
Brown Creeper	*Certhia familiaris*	1		1	R	WR
Wrens						
Carolina Wren	*Thyothorus Ludovicianus*	1		1	C	R
House Wren	*Troglodytes aedon*	1			C	SR
Winter Wren	*Troglodytes troglodytes*	1		1	R	WR
Marsh Wren	*Cistothorus palustris*	1	1	1	U	SR
Old World Warblers and Thrushes						
Golden-crowned Kinglet	*Regulus satrapa*	1		1	U	M, WR
Ruby-crowned Kinglet	*Regulus calendula*	1		1	U	M, WR
Blue-gray Gnatcatcher	*Polioptila caerulea*	1			R	M
Veery	*Cathaurs fuscescens*	1			U	FM
Gray-cheeked Thrush	*Catharus minimus*	1			U	FM
Swainson's Thrush	*Catharus ustulatus*	1			U	FM
Hermit Thrush	*Catharus guttatus*	1		1	U	WR
Wood Thrush	*Hylocichla mustelina*	1		1	C	R
American Robin	*Turdus migratorius*	1	1	1	C	R
Mimids						
Gray Catbird	*Dumetella carolinensis*	1	1	1	C	R
Northern Mockingbird	*Mimus polyglottos*	1	1	1	C	R
Brown Thrasher	*Toxostoma rufum*	1	1	1	C	R
Starlings and Mynas						
European Starling	*Sturnus vulgaris*	1	1	1	A	R
Waxwings						
Cedar Waxwing	*Bombycilla cedrorum*	1		1	C	R
Shrikes and Vireos						
Loggerhead Shrike	*Lanius ludovicianus*	1			R	WV
White-eyed Vireo	*Vireo griseus*	1			R	SR
Solitary Vireo	*Vireo solitarius*	1		1	R	SM
Philadelphia Vireo	*Vireo philadelphicus*	1			R	SM
Red-eyed Vireo	*Vireo olivaceus*	1		1	C	SM
Wood Warblers						
Blue-winged Warbler	*Vermivora pinus*	1		1	C	SM, SR
Orange-crowned Warbler	*Vermivora celata*	1			U	M
Northern Parula Warbler	*Parula americana*	1		1	C	M

Appendix C. Bird Species of the south shore of Long Island, NY.

Common Name	Scientific Name	Likely to Occur	Documented by USFWS 1982	Documented by NEA/USACE 2003	Seasonal Abundance[1]	Seasonal Use[2]
Yellow Warbler	*Dendroica petechia*	1	1	1	C	SR, M
Chestnut-sided Warbler	*Dendroica pensylvanica*	1		1	R	SM, SR
Magnolia Warbler	*Dendroica magnolia*	1		1	U	M
Cape May Warbler	*Dendroica tigrina*	1			U	M
Black-throated Blue Warbler	*Dendroica caerulescens*	1		1	C	M
Yellow-rumped Warbler	*Dendroica coronata*	1		1	C	WR, M
Black-throated Green Warbler	*Dendroica virens*	1		1	R	M
Blackburnian Warbler	*Dendroica fusca*	1			R	M
Pine Warbler	*Dendroica pinus*	1	1		U	SM, SR
Prairie Warbler	*Dendroica discolor*	1	1	1	C	SM, SR
Palm Warbler	*Dendroica palmarum*	1		1	C	SM
Bay-breasted Warbler	*Dendroica castanea*	1			R	SM
Black-and-White Warbler	*Mniotilta varia*	1		1	C	SM
American Redstart	*Setophaga ruticilla*	1		1	C	SR, M
Prothonotary Warbler	*Protonotaria citrea*	1			U	SM
Worm-eating Warbler	*Helmitheros vermivorus*	1			R	SM
Ovenbird	*Seiurus aurocapillus*	1		1	C	SR
Northern Waterthrush	*Seiurus noveboracensis*	1		1	R	SM
Louisiana Waterthrush	*Seurus motacilla*	1		1	R	SM
Common Yellowthroat	*Geothlypis trichas*	1	1	1	C	SR, M
Cerulean Warbler	*Dendroica cerulea*	1			R	M
Wilson's Warbler	*Wilsonia pusilla*	1		1	R	SM
Canada Warbler	*Wilsonia canadensis*	1		1	R	SM
Nashville Warbler	*Vermivora ruficapilla*			1	U	SM
Blackpoll Warbler	*Dendroica striata*			1	R	SM
Yellow-breasted Chat	*Icteria virens*	1			R	SM
Tanagers and Cardinals						
Scarlet Tanager	*Piranga olivacea*	1		1	C	SR, M
Northern Cardinal	*Cardinalis cardinalis*	1	1	1	C	R
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	1		1	U	M
Evening Grosbeak	*Coccothraustes vespertinus*	1			U	M
Indigo Bunting	*Passerina cyanea*	1		1	U	M
Rufous-sided Towhee	*Pipilo erythrophthalmus*	1	1	1	C	R
Sparrows and Allies						
American Tree Sparrow	*Spizella arborea*	1		1	C	WR
Chipping Sparrow	*Spizella passerina*	1		1	C	R
Field Sparrow	*Spizella pusilla*	1	1	1	C	R
Savannah Sparrow	*Passerculus sandwichensis*	1			R	WR, FM
Grasshopper Sparrow	*Ammodramus savannarum*	1	1	1	C	R
Sharp-tailed Sparrow	*Ammospiza caudacuta*	1	1	1	C	R
Seaside Sparrow	*Ammospiza maritima*	1	1	1	C	R
Vesper Sparrow	*Pooecetes gramineus*	1		1	R	FM
Fox Sparrow	*Passerella iliaca*	1		1	C	WR
Song Sparrow	*Milospiza melodia*	1	1	1	C	R
Swamp Sparrow	*Melospiza geogiana*	1		1	U	WR, FM
White-throated Sparrow	*Zonatrichia albicollis*	1		1	A	WR, M
White-crowned Sparrow	*Zonatrichia leucophrys*	1		1	U	M
Dark-eyed Junco	*Junco hyemalis*	1		1	C	WR, M
Lapland Longspur	*Calcarius lapponicus*	1			R	WR
Snow Bunting	*Plectrophenax nivalis*	1		1	C	WR
Icterids						
Bobolink	*Dolichonyx oryzivorus*	1		1	R	SM
Red-winged Blackbird	*Agelaius phoeniceus*	1	1	1	A	R
Eastern Meadowlark	*Sturnella magna*	1			U	WR
Rusty Blackbird	*Euphagus carolinus*	1		1	U	M
Common Grackle	*Quiscalus quiscula*	1	1	1	C	R
Boat-tailed Grackle	*Quiscalus major*			1	U	SM
Brown-headed Cowbird	*Molothrus ater*	1	1	1	C	R
Northern Oriole	*Icterus galbula*	1		1	C	SR, FM

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Common Name	Scientific Name	Likely to Occur	Documented by USFWS 1982	Documented by NEA/USACE 2003	Seasonal Abundance[1]	Seasonal Use[2]
Finches and Old World Sparrows						
Purple Finch	*Carpodacus purpureus*	1		1	U	WR
House Finch	*Carpodacus mexicanus*	1	1	1	C	R
White-winged Crossbill	*Loxia leucoptera*	1			R	WR
Red Crossbill	*Loxia curvirostra*	1			R	WR
Common Redpoll	*Carduelis flammea*	1			R	WR
Pine Siskin	*Carduelis pinus*	1			U	WR
American Goldfinch	*Carduelis tristis*	1		1	C	R
House Sparrow	*Passer domesticus*	1	1	1	A	R
	Total Species	**242**	**51**	**162**		

1 Highest abundance likely during any given season (USFWS 1983).

2 Most likely seasonal use of Project area (USFWS 1983).

Key - R = rare, U = uncommon, C = common, A = abundant

M = spring and fall migrant, FM = fall migrant, SM = spring migrant, R = resident, SR = summer resident, WR = winter resident, SB = summer breeder

SN = summer non-breeder, WV = winter visitor

Appendix D

Database Printout