

**Fire Island National Seashore**

**THREATENED & ENDANGERED SPECIES  
MONITORING PROGRAM  
2011 SUMMARY**



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\*areas are based on New York State's Department of Environmental Conservations' Long Island Colonial Waterbird Sites.

# THREATENED & ENDANGERED SPECIES MONITORING PROGRAM 2011 SUMMARY

## 1. ABSTRACT

Fire Island National Seashore (FIIS) is a National Park unit located just south of Long Island, New York. As part of the Threatened and Endangered Species Program monitoring effort conducted at FIIS, the status of several federal and state-listed threatened and endangered (T&E) species were observed in 2011. Through daily monitoring and a collaborative park effort, a total of 14 piping plover (*Charadrius melodus*) nesting pairs were recorded within the park. With a total of 21 successful piping plover fledglings, nesting productivity reached an average of 1.5 piping plover chicks fledged per pair. Annual population surveys for waterbirds were conducted this season in areas specified by the New York State Department of Environmental Conservation's Long Island Colonial Waterbird surveys. Forty seabeach amaranth (*Amaranthus pumilus*) and 163 seabeach knotweed (*Polygonum glaucum*) plants were documented throughout FIIS. FIIS staff worked cooperatively with Land Use Ecological Services staff (LUES) to monitor federally threatened and endangered species throughout the Fire Island community beaches – notably, piping plovers and seabeach amaranth. Several natural and human-induced disturbances that occurred this year will be discussed. Educational and outreach efforts directed towards park visitors, island residents, cooperating agencies and essential services is critical for the continued success of this program.

## 2. INTRODUCTION

Fire Island National Seashore (FIIS) was established as a unit of the National Park Service on September 11, 1964 (Public Law 88-587). Fire Island is a 32-mile long barrier island located off the south shore of Long Island, N.Y. (Map 1). Fire Island National Seashore occupies 26 miles of this island, punctuated by 17 private communities located predominately on the western half. There are no continuous paved or unpaved roads running the length of Fire Island, therefore, most of the Island's beaches are open to driving with some internal routes through various communities. The National Seashore land is bordered on the west by Robert Moses State Park and on the east by Moriches Inlet. Smith Point County Park, managed by Suffolk County, is within the boundary of FIIS and makes up the eastern seven miles of Fire Island.

Fire Island National Seashore provides suitable breeding/germination habitat for a number of federal- and state-listed threatened and endangered (T&E) species. Protected avian species observed on FIIS are the piping plover (*Charadrius melodus*), least tern (*Sterna antillarum*), common tern (*Sterna hirundo*), roseate tern (*Sterna dougallii*) and black skimmer (*Rynchops niger*). Protected vegetative species include seabeach amaranth (*Amaranthus pumilus*) and seabeach knotweed (*Polygonum glaucum*). Most of these species around found nesting on Fire Island's oceanside beaches and bay islands.

Of the several species observed, the piping plover constitutes the largest portion of the monitoring program effort. Listed as a federally threatened species in 1986, FIIS has worked extensively toward the recovery of the piping plover. Due to limited resources the only threatened and endangered plant species monitored this year were seabeach amaranth (amaranth) and seabeach knotweed (knotweed).

Amaranth was believed to have been extirpated in New York for over three decades until isolated populations began to appear on Long Island in the early 1990s. Amaranth was listed as federally threatened in 1993 and knotweed is listed as a New York State species of concern.

### **3. OBJECTIVE**

It is the objective of Fire Island National Seashore to follow the management goals set forth in the Endangered Species Act (1973), Endangered Species Habitat Management Plan (1998), and the US Fish & Wildlife Piping Plover Atlantic Coast Population Revised Recovery Plan (1996) for the protection and productivity of nesting threatened and endangered species. These guidelines include monitoring breeding/germination populations, documenting productivity, limiting human disturbance to areas with suitable habitat, protecting listed species from potential predators, and educating the public. The purpose of this report is to present the results of the 2011 T&E species program conducted on Fire Island National Seashore and discuss areas of improvement for the upcoming field season.

### **4. PRESEASON PROTOCOL**

In accordance with USFWS guidelines, preseason habitat fencing (symbolic fencing) is erected for the purpose of protecting avian species nesting habitat and potential vegetative species habitat. In 2011, symbolic fencing was constructed and established in early April, prior to the onset of the piping plover breeding season. Areas to be fenced were determined through the compilation of nest/plant data collected from previous years, early season plover observations, and through visual assessments of habitat.

Throughout sections of FIIS, restrictions and/or beach closures are implemented regarding vehicles and pets. While some beaches on Fire Island are open to driving, vehicles are prohibited from a 0.7 mile section of the beach at Sailors Haven year-round, and the OPWA is closed to vehicular traffic from March 15<sup>th</sup> through September to coincide with the piping plover breeding season. Additional closures of areas to ORVs occur when nesting/hatching of nests is imminent, due to the documented negative effects vehicular driving on the beach has on the nesting success of breeding shorebirds, as well as the germination of threatened/endangered plants. As with driving, domestic dogs (*Canis lupus familiaris*) have also proven harmful to the success of some shorebirds and are thereby ordered to be restrained at all times on a leash which shall not exceed six feet in length while on the beaches of a NPS unit (36 CFR2.15). Pets are entirely prohibited from areas of beach with unfledged chicks of piping plover or other protected species present on federal tracts. In the past (2010), Executive Orders (EOs) by the Town of Brookhaven were issued on non-federal tracts within FIIS to protect nesting and unfledged piping plovers from unleashed dogs on the beach.

At the beginning of the nesting season, additional preventative measures are implemented for the protection of the piping plovers. In order to protect nests from avian and mammalian predators, wire exclosures are erected and placed around the nest site. Exclosures are ten feet in diameter and are constructed using 2 x 4 inch galvanized welded mesh fencing. The fence is then buried approximately 12 inches deep and supported by four Carsonite™ posts which are buried and attached to the fencing using multi-purpose zip ties. In order to deter avian predators, a ¾ inch nylon mesh is placed over the top of the exclosure and tied down with zip-ties.

## 5. MONITORING PROTOCOLS

### 5a. PIPING PLOVER MONITORING

Piping plover migration to Fire Island occurs between late February and March, with tern species arriving in late April and early May. During these early weeks when plovers are establishing nesting territories, the entire island is scanned for activity. In accordance with USFWS guidelines, pre-season habitat fencing (symbolic fencing) is erected for the purpose of protecting nesting habitat and potential vegetative species habitat. Areas to be fenced on federal tracts were determined through the compilation of nest/plant data collected from previous years, early season plover observations, and through visual assessments of the beach. In addition, using these similar techniques and abiding by conditions in the 2009 beach nourishment permit, FIIS Wildlife Biologist assisted Land Use Ecological Services (LUES) staff with deciding which areas to fence in front of Fire Island communities.

Areas where birds are seen regularly are more intensely monitored and symbolic fencing is erected and adjusted accordingly. For example, the Wilderness area has in years past consistently yielded the highest piping plover productivity and is thus monitored closely beginning in early April. The west-end of the island is also monitored closely by FIIS and LUES staff due to high volume of visitation and beach driving. Off-road vehicles (ORV) may be utilized as a means of transportation to these areas. This preliminary monitoring process continues until the discovery of the first nests, usually in early May. Breeding pairs of plovers are identified using binoculars and observed for specific territorial, courtship and nesting behaviors. These behaviors include (but are not limited to) parallel runs, aerial displays, scrapping, broken-wing display, and vocalization (Cairns 1982).

Regardless of nest location along FIIS shore, all nests were protected within symbolic fencing borders creating a buffer zone of no less than 50 meters on all sides. In areas that were heavily populated by beachgoers, the buffer zone was enlarged in order to decrease the amount of human disturbance and allow for greater habitat protection. The majority of nests were exclosed as an additional protective force against predators. The decision to exclose a nest was decided by the Wildlife Biologist, based on the nests location and visibility to the public and on the known predator population near the nest. Upon discovery of a nest, an alphanumeric tag is used to identify each nesting pair and nest; a number and year are assigned chronologically, using an "A" for first nesting attempt, "B" for second, and so on (eg.1A-11).

Monitoring efforts for nesting activity are increased after pairing or copulation is observed. Field biologists lead intensive daily monitoring observations for the purpose of quickly identifying nests and exclosing them at full-clutch status. This effort helps ensure minimal disturbance towards breeding pairs and allows for accurate estimation of hatch and fledge dates. An average hatch date of 27 days from the full clutch date is determined utilizing a chart produced by New York State Department of Environmental Conservation (NYSDEC). Each day, a nest is carefully observed with binoculars from a distance no less than 50 meters, and the activity of the birds is recorded. Daily nest site observation information is recorded on individual data sheets for each nest then transferred to an Excel spreadsheet.

Daily brood monitoring is initiated after the first piping plover egg is hatched. Cautious attention is given to all plover chicks, since chicks are most vulnerable to predation during their first week after

hatching. Data collected for each brood consists of: number and behavior of adults, number of chicks observed, and location. Careful efforts are made to properly distinguish amongst chicks, especially where nests are in close proximity to each other. Age, size, and plumage are the major factors in differentiating chicks. During instances of missing chicks, field biologists are to scan the vicinity of the nest site for those unaccounted for a period of five days in accordance with USFWS guidelines. It takes 25-35 days after hatching for a plover chick to fledge. Chicks are either considered fledged when witnessed 35 days after they have hatched or when a sustained flight of 15 meters is observed before then. When a nest is situated near a vehicle beach access route, a fledge date of 35 days is implemented and driving restrictions are extended to ensure the safety of the brood (USFWS 1996).

#### **5b. COLONIAL WATERBIRD SURVEY**

Population counts for colonial waterbirds were conducted twice during the 2011 season in June, once June 1-15, and once June 15-July 1. Sponsored by the NYSDEC, the Long Island Colonial Waterbird Survey (LICWS) monitors the presence and populations of various colonial waterbirds. Many of the sites surveyed are located on Fire Island's ocean and bay beaches between the Lighthouse Tract and Smith Point County Park. Several bay islands that fall within the boundaries of the park are also monitored for waterbirds, including: Sexton Island, West Fire Island, East Fire Island, Long Cove, Ridge Island, Pelican Island, John Boyle Island, and Hospital Island. These bay islands can only be reached by motorboat, canoe or kayak, and access may be limited by inclement weather, remoteness of location, and time constraints.

#### **5c. VEGETATION MONITORING**

Amaranth and knotweed begin to germinate on FIIS in early July. These plants tend to grow in early successional beach/dune habitat—the same type as preferred by piping plovers and least terns for nesting. For this reason, symbolic fencing established for plover and tern nesting habitat remain up during germination period for amaranth and knotweed. Fencing may be adjusted after initial sweep counts to provide a buffer around plants. Field biologists conduct vegetation monitoring sweep counts throughout FIIS, both on foot and using an ORV, traveling parallel to the toe of the dune. A GPS unit is used to collect data points for the locations of amaranth and knotweed plants, and individuals or clusters are marked with pinflags or stakes. All plants located outside of existing symbolic fencing should be marked, enclosed within fencing, and recorded with a GPS. Other data collected include location, plant condition, size, reproductive status, cluster number, potential threats, weather conditions, and general observations in accordance with data sheets provided by the U.S. Fish and Wildlife Service and The Nature Conservancy. We continue conducting sweep counts for new amaranth and knotweed plants and monitor existing amaranth plants throughout August and early September until plant growth and reproduction ceases.

### **6. RESULTS**

#### **6a. PIPING PLOVERS (*Charadrius melodus*)**

Monitoring for the 2011 piping plover breeding season on Fire Island began when the first piping plovers were observed in early April and continued through the end of July. In the months between

April and July, piping plover nests were discovered and documented throughout FIIS.

A total of 14 nesting pairs were documented, from which there came 16 nesting attempts throughout the island. Eleven nests hatched and ten nests successfully fledged chicks. Nests were lost due to predation and overwashes.

A total of 60 eggs were laid and 38 of these total eggs hatched, with the remainder failing as a result of predation, overwash or other circumstances (Figure 2). Twenty-one chicks went on to fledge, yielding a productivity of 1.5 for 14 breeding pairs (Table 3).

A breakdown of the number of eggs that hatched and their survival rate is displayed in a bar graph showing the number of chicks that survived past 1 day, those that lived past 2 weeks and those that went on to fledge. Four chicks did not survive past day 1 (Figure 3).

#### **i. Summary of piping plover nests**

A summary of plover nest activity on the western half of the island is as follows: 2 nesting pairs at Lighthouse Beach (1A, 10A), 1 at Robbins Rest (6A), and 2 at Point O' Woods (2A, 12A).

The Otis Pike Fire Island High Dune Wilderness Area (OPWA) yielded 9 plover pairs and 11 nesting attempts which were divided by location: OPWA West (Watch Hill to Bellport Beach) and OPWA East (Bellport Beach to the Wilderness Visitor Center). There was 1 nesting pair in the OPWA West (3A, 3B). In the OPWA East there were 8 nesting pairs, 4 between Bellport and Old Inlet (8A, 8B, 11A, 14A, 5A), 3 of which were in the overwash (4A, 9A, 13A), and 1 nest east of the overwash (7A). Below is a summary of each attempt:

Nest **1A-11** was found with 4 eggs on April 30<sup>th</sup> on the eastern end of Lighthouse beach. The nest was exclosed on May 2<sup>nd</sup>. On May 28<sup>th</sup>, all 4 chicks had hatched. The 4 chicks were observed by FIIS staff and volunteers daily, from May 28<sup>th</sup> through June 27<sup>th</sup>. At 35 days old all 4 chicks had fledged.

Nest **2A-11** was discovered on May 2<sup>nd</sup> with 4 eggs, located approximately ~300 meters west of Oakleyville driving cut in the Point O' Woods community. The nest was exclosed that same day, after receiving permission from the Point O' Woods community. A thunderstorm on May 18<sup>th</sup> produced high tides up to the symbolic fencing, and FIIS staff noticed the next day that vehicle tracks were just outside of the fencing. On May 29<sup>th</sup>, all 4 chicks had hatched. FIIS staff noticed dune fencing construction around the fenced plover area and fox tracks behind the fencing. Only 2 chicks were seen 4 days later. Staff continued to see fox tracks and observed crows in the area. At 9 days old, only one chick was observed. On June 19<sup>th</sup> the chick (22 days old) was seen by FIIS staff, flapping its wings and attempting to fly. That one chick made it to fledge and was observed until June 24<sup>th</sup> when it was 27 days old.

Nest **3A-11** was discovered with 1 egg on May 3<sup>rd</sup> in the eastern end of OPWA West. Two eggs were observed by FIIS staff on May 6<sup>th</sup>. By May 9<sup>th</sup> there was a full clutch and the nest was exclosed. On May 18<sup>th</sup> the nest was checked and the eggs had been buried by sand; there had been strong winds from a storm the previous night. The plovers were seen foraging to the east of the buried nest.

Nest **3B-11** was discovered on May 25<sup>th</sup> with 1 egg ~200 meters east from the buried nest, 3A. The nest reached a full clutch of 4 eggs on May 30<sup>th</sup>. On June 8<sup>th</sup> the nest was exclosed and fox tracks and scat were observed by FIIS staff less than one meter from the nest. On June 26<sup>th</sup>, 2 hatched chicks were observed with no eggs remaining in the nest. That same day FIIS staff observed evidence that a red fox had dug around the predator exclosure, but had not reached underneath the exclosure. The next day one of the chicks was seen with an injured/deformed right leg. At 5 days old, only 1 chick was seen and observed until July 25<sup>th</sup>, when it was 30 days old and fledged.

Nest **4A-11** was found with 3 eggs on May 6<sup>th</sup> far back in the overwash area, in OPWA East. A full clutch was completed on May 8<sup>th</sup> and the next day a predator exclosure was installed. On June 5<sup>th</sup>, FIIS staff observed no plovers incubating, one egg was still in the nest and no other observations were made. The next day staff found 2 adults and 3 chicks foraging south of the exclosure, with one egg still unhatched. At 3 days old, 3 chicks were seen. On June 20<sup>th</sup>, at 16 days old, one chick was observed flapping its wings. FIIS staff observed an adult plover chasing a Great Black-Backed Gull on June 26<sup>th</sup>, in flight, while the 3 chicks foraged at the wrack line. All 3 chicks made it to fledge and were last observed on July 7<sup>th</sup>, at 34 days old.

Nest **5A-11** was discovered on May 10<sup>th</sup> with 2 eggs located in the OPWA East, in the Bellport to Old Inlet section. The nest was exclosed on May 12<sup>th</sup> with 3 eggs. The adult plover did not resume incubation immediately after the exclosure was installed because a red-winged blackbird was too close to the nest and the plover kept chasing it. Staff left and drove by an hour later and the adult was incubating. A full clutch was completed on May 13<sup>th</sup> and crows were observed flying over the area. That same day two American oystercatchers were observed harassing the plovers. Broken wing displays and chasing were observed as the oystercatchers started to go near the nest. A small least tern colony was nearby and a least tern started dive bombing the oystercatchers and eventually chased them away from the area. All eggs hatched and 3 chicks were observed at 5 days old. At 7 days old 4 chicks were observed. Three chicks were observed from June 9<sup>th</sup> - 27<sup>th</sup>, when the chicks were 19 days old. Two chicks were seen on June 30<sup>th</sup> at 22 days old and at 25 days old only 1 fledgling was observed.

Nest **6A-11** was located in the federal tract of land between the communities of Robbins Rest and Atlantique. This federal tract receives heavy vehicle traffic and high densities of foot traffic on the beach. The nest was found on May 18<sup>th</sup> with 2 eggs in a fenced area of upper beach. FIIS staff observed vehicle tracks only meters away from the nest. Symbolic fencing was cut down, and vehicles had driven through the fenced area when a storm produced high tides the night before. Staff re-installed the fencing and put up more signs to inform the public. A predator exclosure was erected the next day and a camera trap was installed for enforcement purposes. A full clutch of 4 eggs was estimated for May 22<sup>nd</sup>. On June 13<sup>th</sup> the symbolic fencing was cut down and staff had to re-install it and beach driving restrictions were put in place because of the impending hatch date. The nest hatched only 3 of 4 eggs on June 17<sup>th</sup>. Three chicks were observed on June 21<sup>st</sup>. Another camera trap was installed near Robbins Rest in the eastern driving cut. No significant photographs were retrieved from the traps. Vandalism and theft of symbolic fencing at driving cuts and in plover habitat was observed every other day from June 13<sup>st</sup> until the driving restrictions were lifted on July 22<sup>nd</sup>. On June 27<sup>th</sup>, FIIS staff observed all of the symbolic fencing pulled out and the predator exclosure was vandalized and damaged beyond repair. The plovers were behind the torn down fencing with the 3 chicks resting and sitting. Staff took photographs of the scene and filed a case incident report and witness statements for law enforcement rangers. Staff removed the exclosure from the area and re-installed the symbolic fencing

for the habitat and for the driving cuts. No tickets or charges were made in reference to the vandalism. One ticket was issued by law enforcement rangers for unauthorized driving on the beach. All 3 chicks that hatched survived to fledge and were last observed, by a volunteer, at 36 days old, July 23<sup>rd</sup>. A nesting least tern colony of forty to fifty least terns also resided in this same tract of land. The colony produced at least 4 fledglings. The colony's protective nature of their nesting site may have aided the productivity of the piping plover pair at Robbins Rest.

Nest **7A-11** was found on May 20<sup>th</sup> with 3 eggs in OPWA east. This easternmost nest was found east of the overwash and just west of the Wilderness Visitor Center. That same day the nest was successfully exclosed. The nest was located on the top of a 1 meter tall scarp that had formed from a spring storm. A full clutch of 4 eggs was confirmed on June 1<sup>st</sup>. On June 19<sup>th</sup>, 3 chicks were observed (and no unhatched eggs) and the adults were moving the chicks west at a rapid pace, away from the scarped area. The group ended up at the hiking trail cut in the eastern most section of the overwash. The 3 chicks were observed from June 19<sup>th</sup> – July 7<sup>th</sup> at 20 days old. A week later only 2 fledges were seen (27 days old) with an adult plover and were observed by FIIS staff for 30 minutes. It was concluded that 2 chicks made it to fledge.

Nest **8A-11** was first observed on May 25<sup>th</sup> with 1 egg in the area between Bellport Beach and Old Inlet in OPWA East. A full clutch of 4 eggs was completed on May 29<sup>th</sup>. On May 31<sup>st</sup> a predator exclosure was installed. Immediately after the exclosure was installed, the plovers continued vocalizing and walking around the exclosure. After observing the pair for 70 minutes, the plovers rejected the exclosure. Once the exclosure was removed the pair resumed incubation within one minute. The following day FIIS staff observed no plovers incubating the nest. Upon further investigation the nest was found to be predated - there were fox tracks surrounding the nest and no eggs were found. A week later on June 5<sup>th</sup>, the pair was seen ~200 meters east of the predated nest displaying broken wing to a least tern over a scrape with no eggs.

Nest **8B-11** was found on June 8<sup>th</sup> with 1 egg in the area between Bellport Beach and Old Inlet in OPWA East, ~200 meters east of 8A. The nest was located only a few meters north of the current high tide line. A full clutch was observed on June 16<sup>th</sup>. A strong thunderstorm occurred two days later with high tides and wind gusts. On June 19<sup>th</sup> the nest was discovered by FIIS staff to be overwashed from the storm's high tides and the plovers were not sighted in the immediate area. The pair was observed occasionally during the season in this area but never re-nested.

Nest **9A-11** was discovered on May 25<sup>th</sup> with 3 eggs in the overwash area of OPWA East. The nest was successfully exclosed the next day. On June 23<sup>rd</sup>, FIIS staff observed only two chicks hatched; two eggs were in the nest. Three days later the nest was checked again, but two eggs had remained unhatched. The two chicks were observed until July 4<sup>th</sup>. After July 4<sup>th</sup>, only one chick was observed at 15 days and on/after July 7<sup>th</sup> no further observations were made for this chick - it was concluded that the chick did not survive.

Nest **10A-11** was found on May 28<sup>th</sup> with 3 eggs on the westernmost section of Lighthouse Beach. On June 6<sup>th</sup> the nest still had only 3 eggs. The full clutch was only 3 eggs and it was decided by the FIIS Wildlife Biologist to not exclose the nest. This nest was located on a popular beach area and exclosing it would have brought more attention to the pair. On June 23<sup>rd</sup> 3 chicks hatched and were resting in the nest. From June 25<sup>th</sup> - July 6<sup>th</sup> only 2 chicks were observed. On July 13<sup>th</sup>, an adult plover chased an

American crow while the chick ran up into the dune grass. On July 18<sup>th</sup> only one chick was observed, and 2 days later the 1 chick was seen flying over 30 feet ~2 feet above the ground. That one chick was last seen on July 23<sup>rd</sup> by FIIS volunteers, at approximately 31 days old.

Nest **11A-11** was found with 1 egg and 1 chick already hatched on June 20<sup>th</sup> in the dune grass of OPWA East, between Bellport Beach and Old Inlet. Three days later 2 chicks were observed with 1 egg still unhatched in the nest. This brood stayed close to their nesting area and was mainly observed in the dune grass. One – two chicks were observed; the chicks stayed up in the dune grass, making it more difficult to get an exact number. It was concluded that two chicks were observed until fledge date at 25 days old, July 14<sup>th</sup>.

Nest **12A-11** was discovered on June 21<sup>st</sup> with 3 eggs. The nest was found in the community of Point O'Woods ~100 meters west of Nest 2A. A least tern colony was located around the plover's nest and at the time there were around 20 nesting least terns. Two days later the nest was checked and 3 eggs were still found in the nest and the pair was determined to be at full clutch. On June 26<sup>th</sup> the nest was checked and no plovers were observed and no eggs were found. There were fresh 4WD vehicle tracks behind and through the fenced area as well as fox tracks. The nest was determined to be predated. No re-nests were attempted.

Nest **13A-11** was found on June 23<sup>rd</sup> with a full clutch of 4 eggs in the overwash area of OPWA East only 50 meters west of nest 9A. Three days later, no birds were incubating the nest. Upon further investigation the nest had no eggs, and no evidence of predation. FIIS staff combed the overwash area and found 4 hatched chicks with the adults. The group was found 100 meters east of the nest location and continued to stay in that area. The next day, while observing the chicks, FIIS staff noticed one chick had an injured right leg. On June 30<sup>th</sup>, only 3 chicks were observed - the injured chick did not survive. The 3 chicks were observed at 31 days old and were recorded as fledged.

Nest **14A-11** was discovered with 2 eggs on June 23<sup>rd</sup> in the area between Bellport Beach and Old Inlet in OPWA East. The next observation was made three days later and no eggs or plovers were found. There were no red fox tracks directly around the nest; predation occurred, but by another species.

#### **6b. COLONIAL WATERBIRDS (*Sterna* spp)**

Efforts were made to conduct Long Island Colonial Waterbird Surveys on Fire Island and its smaller islands in the Great South Bay. Although all breeding bird species were identified by FIIS staff, the NYSDEC is most interested in breeding least terns (*Sterna antillarum*; LETE), common terns (*Sterna hirundo*; COTE) and black skimmers (*Rynchops niger*; BLSK). Almost all areas were covered, but unfortunately some of them were not surveyed in both time windows due to various circumstances such as weather events, motorboat activity and remoteness of location. The first window was from June 1<sup>st</sup> through June 14<sup>th</sup> and the second window was from June 15<sup>th</sup> through June 30<sup>th</sup>.

In total, 16 different sites were surveyed throughout the month-long effort (Table 4) including 9 bay islands and 6 sections of Fire Island. COTE and/or LETE colonies were observed in the following areas: Sexton Island, East Fire Island, Long Cove, Ridge Island, Fire Island Villages and the Otis Pike Fire Island High Dune Wilderness Area beach. Annual population surveys for least tern, common tern,

and roseate tern species resulted in total maximum counts (the greatest number counted during a survey period for each site) of 101, 925, and 0 respectively.

As for bay islands, Ridge Island was a new site to support a tern colony in 2010 – a maximum of 350 COTEs were observed. Fortunately, Ridge Island supported a colony in 2011 as well, with 500 COTEs observed during the first survey period. Long Cove supported a large colony of 300 COTE observed in the second survey window. There was a decrease in COTE numbers this year at Sexton Island and East Fire Island relative to last year. From 2010 to 2011 Sexton Island's COTE numbers went from 140 to 80 and East Fire Island from 495 to 45. In addition, there was a LETe colony of 75 individuals on East Fire Island in 2009; however, no LETEs were sighted in 2010 and only 16 individuals in 2011. The survey in 2009 was done after the 2<sup>nd</sup> window on July 14<sup>th</sup>, which may underline the importance of consistent surveying during the survey windows throughout Long Island for the LICWS (Table 4).

As for sections on Fire Island, the OPWA, Fire Island Villages (specifically Robbins Rest and Point O' Woods communities) and East Fire Island were the only areas with LETEs observed. The primary colony was located in Robbins Rest, with approx. 50 adults, counted on July 12<sup>th</sup>. The Point O' Woods colony had a population of 40, counted on June 27<sup>th</sup>. In the OPWA, a colony of 48 LETEs was observed, but was not productive. In 2009 there were several small colonies of LETEs observed throughout Fire Island, with only 1-4 breeding birds. In 2010 no LETEs were observed outside of the OPWA site, but this year LETEs were observed in other areas of Fire Island (Table 4).

#### **6c. VEGETATION (*Amaranthus pumilus* and *Polygonum glaucum*)**

A total of 40 seabeach amaranth plants were found in the several sweep counts on FIIS throughout July and August (Figure 5). Sites from the LICWS were recognized and reported as such for each species: Lighthouse, Fire Island Villages, Sailors Haven, Fire Island Pines, and the Otis Pike Wilderness Area. Sites found with amaranth included Lighthouse beach (4 plants), Fire Island Villages (7 plants), Sailors Haven (2 plants), Fire Island Pines (6 plants), and OPWA (21 plants). Twenty-two out of 40 plants showed signs of herbivory (55% of plants), presumably from white-tailed deer (*Odocoileus virginianus*): 2 plants in Lighthouse beach, 3 plants in Fire Island Villages, 2 plants in Sailors Haven, 4 plants in Fire Island Pines, and 11 plants in OPWA. A mixture of large and small plants was observed with the average size being 12.4 cm in diameter at the widest point. Only 6 out of 40 plants showed beginning signs of reproduction (15% of plants). The majority of plants were located inside the symbolic fenced areas designated initially for piping plover and least terns.

Surveying for seabeach knotweed was concurrent with that for seabeach amaranth (July-August). A total of 163 knotweed plants were counted and marked throughout FIIS (Figure 5). Sites found with knotweed include Lighthouse beach (82 plants), Fire Island Villages (23 plants), Sailors Haven (16 plants), Fire Island Pines (24 plants) and OPWA (18 plants). Both federal and non-federal tracts of land were surveyed in 2011. Most of the plants were a mix of large and small sizes and located inside the symbolic fenced areas designated initially for piping plover and least terns.

Hurricane/Tropical Storm Irene caused severe high tides on southern Long Island on August 27<sup>th</sup> – 28<sup>th</sup>; this caused burial or sustained salt water inundation of amaranth and knotweed plants at most sites on Fire Island which resulted in the death of most plants.

## **7. DISCUSSION**

### **7a. DISTURBANCE ISSUES IN 2011**

#### **7ai. ANTHROPOGENIC DISTURBANCES**

There were several anthropogenic and natural disturbances to T&E species in 2011. Anthropogenic disturbances refer to direct and indirect human interactions with T&E species. This includes heavy foot traffic, removal of symbolic fencing, driving in and adjacent to suitable habitat areas, and domesticated animal disturbances. Natural disturbances refer to other wildlife interactions that negatively impact the species. This includes predation and competition for beach resources.

Numerous pairs chose to nest in areas with high seasonal visitation, where seasonal residents/visitors increased exponentially between the time the nesting territory was established and the time the eggs were laid. As in previous years, nests were subject to disturbances in these areas due to human activity. Disturbance caused by off-road vehicles (ORV) was minimized by closing certain beach access points (dune crossings) and sections of beach and providing signage for alternative routes through the interior of the island.

FIIS staff follows USFWS (1996) guidelines: full-sized vehicles shall not be permitted on beaches where unfledged chicks are found, and that beach access points/dune crossings found within 1000 feet of a nest with chicks be closed to all traffic until those chicks are fledged (35 days after hatching for chicks near vehicle areas). The FIIS Wildlife Biologist continued the Plover Hotline (631-687-5030), first established in 2010, which was regularly updated with information on dune crossing/beach closures to vehicles. Adequate warning of closures (2-3 weeks) was given for established nests when possible.

The following beach driving closures were implemented during the 2011 season:

- The Kismet driving cut was closed May 21<sup>st</sup>; 1A was approximately 260 meters from the driving cut. The chick and adults from nest 10A traveled east after the chick had hatched approximately 700 meters from the Kismet driving cut. Therefore the Kismet driving cut remained closed until July 22<sup>nd</sup> after the chick had fledged.
- On May 21<sup>st</sup> the Ocean Bay Park/Point O'Woods driving cut and the Oakleyville driving cut were closed. 2A was approximately 885 meters and 600 meters away from these driving cuts, respectively. These two driving cuts remained closed until July 1<sup>st</sup>.
- The Atlantique and Robbins Rest/Summer Club driving cuts were closed on June 13<sup>th</sup> and remained closed until July 22<sup>nd</sup> after the chicks had fledged. Nest 6A was approximately 720 meters and 235 meters away from these driving cuts, respectively.

Although these driving cuts were closed by FIIS, the beach was not void of vehicles. Many full-sized vehicle tracks were observed and symbolic fencing to mark the closed driving cuts had been removed or discarded, as well as unauthorized vehicles driving on the beach near and through nesting sites. Park Rangers were notified during each witnessed incident and pictures were provided when necessary.

Dogs were frequently seen off their leash, sometimes in areas where dogs were entirely prohibited. Every day, particularly at the peak of the summer season, there were several dogs observed both on and off their leash on community beaches. This became a major regulation issue and a cause for concern, especially for plover broods in the communities.

Feral cats and domesticated cats living within the communities, in previous years have posed a threat to plovers. Cats act as predators and will hunt and harass nesting birds and chicks. This season no plovers nested near known feral cat colonies.

#### **7a.ii. NATURAL DISTURBANCES**

Gulls, raccoons, red fox, ghost crabs, and a variety of avian wildlife in FIIS can pose a threat or disturbance to nesting piping plovers and their broods. Avian predators seen disturbing piping plover adults and broods include great black-backed gulls (*Larus marinus*), herring gulls (*Larus argentatus*), crows (*Corvus* spp.), oystercatchers (*Haematopus palliatus*), and red-winged blackbirds (*Agelaius phoeniceus*).

Based on field observations, the predominant predator for the nesting piping plover on Fire Island during the past several years has been the red fox (*Vulpes vulpes*). Red fox tracks were recorded inside the symbolic fencing and at times circling the exclosures. Evidence of red fox was especially prevalent in the OPWA, specifically in the area just west of Bellport Beach. One example was at Nest 3B where a fox had dug all the way around the exclosure but did not dig through to the nest. 3B had already hatched and they fledged one chick in that area. Red fox tracks were often observed at the toe of the dune throughout the 7-mile stretch of wilderness. Furthermore, several nests were predated or abandoned after red fox tracks were seen in the vicinity of nests. Fox tracks were observed in close proximity to seven nests (2A, 3B, 8A, 9A, 11A, 12A, and 14A) and attempted digging around exclosures was observed at one nest (3B). Four nests were predated before the chicks hatched (8A, 11A, 12A, and 14A). The presence of predators may be accountable for the occurrences of assumed predation of chicks in the OPWA and Point O'Woods. However, other disturbance factors are also affecting the productivity of T&E species and it's difficult to determine one cause for failure.

Another natural disturbance that faces the success of piping plover productivity is the effect of storms and high tides sweeping over the nesting area. When a high tide encroaches on the nesting territory the nest can then be covered by sand or washed away. Two nests this season were overwashed, Nest 3A and Nest 8B, which were both located in the OPWA.

Significant browsing of seabeach amaranth individuals was observed this season. Twenty-two out of 40 plants showed signs of herbivory (55% of plants), presumably from white-tailed deer (*Odocoileus virginianus*): 2 plants in Lighthouse beach, 3 plants in Fire Island Villages, 2 plants in Sailors Haven, 4 plants in Fire Island Pines, and 11 plants in OPWA. The intensity of herbivory on individuals varied.

#### **8. RECOMMENDATIONS**

This section is provided to highlight specific suggestions and concerns pertaining to the T&E species monitoring effort.

- During the 2011 field season, vehicle dune crossing routes had to be closed due to the close proximity of piping plover nests and chicks. This is in accordance with the USFWS recovery effort guidelines for managing recreational activities in piping plover breeding habitat. This year FIIS resource management staff observed over 24 incidents of vandalism and/or theft to either the driving cut's fencing or signs or fencing around active plover habitat; one ticket was issued by park rangers for unauthorized driving on the beach.

It will be beneficial to continue the effort to give prior warning to vehicle route closures so there is less confusion and fewer complications. It will continue to be critical that efforts are made to forewarn island residents, essential service agencies, local police, and park staff of upcoming vehicle route closures. Although proper warning was given and signage was posted, enforcement of beach closures was not sufficient in eliminating beach driving as a threat to protected species. In the future, different communication methods and possibly more stringent enforcement measures should be considered.

- The observations from this season and previous ones implicate red fox as a major threat to piping plover breeding and productivity success. While tracks indicate that fox are present at predated nests, there is no direct observational evidence to prove they are the direct cause of the mortality. In the future, it is suggested that motion sensitive cameras (*i.e.*, camera traps) are used for a more conclusive way to determine the exact occurrence of predator and disturbance activities near FIIS's protected species. A research project was started in 2011 by Pace University (PI, Dr. Melissa Grigione) to look closer at red foxes through seasonal diet analysis and statistically summarizing the park's monitoring data to assess whether red fox pose a significant threat to threatened and endangered species.
- Observational data has shown white-tailed deer to be a possible threat to the survival and reproduction of seabeach amaranth. Several plants in 2008, 2010 and 2011 showed signs of intense herbivory. The FIIS Wildlife Biologist should discuss amaranth exclosure options with other parks implementing this protective measure, such as Asseateague Island National Seashore. In addition, the herbivory of amaranth has been brought to the attention of the park's Vegetation and White-tailed Deer Management planning team and is being considered in the plan/EIS.
- Cooperation with Concessions staff also plays a crucial role in informing the public of regulations. It is important for visitors to know about pet regulations before coming to Fire Island National Seashore and the Ferry concessions are oftentimes the first contact for people with pets. The continued improvement of communication, including formal and informal efforts, is integral to the efficacy of this program.

Experience has shown that threatened and endangered species populations can increase dramatically in response to intensive protection efforts. These efforts are time-consuming, costly, and sometimes require temporary restrictions of off-road vehicles and/or recreational activities. Nevertheless, they are highly effective and extremely rewarding.

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## Appendix A: Tables and Figures

| Scientific name              | Common name               | Park Status     | Currently monitored?<br>(Y/N) | Management Priority Details                                    |
|------------------------------|---------------------------|-----------------|-------------------------------|----------------------------------------------------------------|
| <i>Amaranthus pumilus</i>    | <b>Seabeach amaranth</b>  | Present in park | Y                             | Global rank: G2<br>Federal: threatened<br>NY State: endangered |
| <i>Polygonum glaucum</i>     | <b>Seaside knotweed</b>   | Present in park | Y                             | NY State: rare                                                 |
| <i>Kinosternon subrubrum</i> | <b>Eastern mud turtle</b> | Present in park | N                             | Global rank: G5<br>NY State: endangered                        |
| <i>Charadrius melodus</i>    | <b>Piping plover</b>      | Present in park | Y                             | Federal: threatened<br>NY State: endangered                    |
| <i>Sterna hirundo</i>        | <b>Common tern</b>        | Present in park | Y                             | NY State: threatened                                           |
| <i>Rynchops niger</i>        | <b>Black skimmer</b>      | Not present     | Y                             | NY State: special concern                                      |
| <i>Sternula antillarum</i>   | <b>Least tern</b>         | Present in park | Y                             | NY State: threatened                                           |
| <i>Sterna dougallii</i>      | <b>Roseate tern</b>       | Not present     | Y                             | Global rank: G5<br>Federal: endangered<br>NY State: endangered |

**Table 1: List of federal and state-listed threatened and endangered species at Fire Island National Seashore.**

| <u>Year</u>    | <u>Breeding Pairs</u> | <u>Nest Attempts</u> | <u>Productive Pairs</u> | <u>Eggs Hatched</u> | <u>Hatchlings per Breeding Pair</u> | <u>Chicks Fledged</u> | <u>Chicks Fledged per Nest Attempt</u> |
|----------------|-----------------------|----------------------|-------------------------|---------------------|-------------------------------------|-----------------------|----------------------------------------|
| 1993           | 7                     | 7                    | 0                       | 0                   | 0                                   | 0                     | 0                                      |
| 1994           | 3                     | 4                    | 0                       | 0                   | 0                                   | 0                     | 0                                      |
| 1995           | 9                     | 2                    | 1                       | N/A <sup>1</sup>    | N/A                                 | 2                     | 1                                      |
| 1996           | 2                     | 1                    | 1                       | N/A                 | N/A                                 | 1                     | 1                                      |
| 1997           | 1                     | 1                    | 0                       | 0                   | 0                                   | 0                     | 0                                      |
| 1998           | 1                     | 1                    | 1                       | N/A                 | N/A                                 | 1                     | 1                                      |
| 1999           | 3                     | 2                    | 2                       | N/A                 | N/A                                 | 5                     | 2.5                                    |
| 2000           | 3                     | 3                    | 3                       | N/A                 | N/A                                 | 9                     | 3                                      |
| 2001           | 4                     | 4                    | 4                       | N/A                 | N/A                                 | 11                    | 2.8                                    |
| 2002           | 10                    | 11                   | 9                       | 33                  | 3.3                                 | 28                    | 2.6                                    |
| 2003           | 20                    | 22                   | 15                      | 64                  | 3.2                                 | 35                    | 1.6                                    |
| 2004           | 17                    | 18                   | 15                      | 57                  | 3.4                                 | 37                    | 2.1                                    |
| 2005           | 17                    | 20                   | 14                      | 54                  | 3.2                                 | 40                    | 2                                      |
| 2006           | 21                    | 26                   | 15                      | 46                  | 2.2                                 | 32                    | 1.23                                   |
| 2007           | 25                    | 35                   | 11                      | 45                  | 1.8                                 | 18                    | 0.5                                    |
| 2008           | 15                    | 26                   | 8                       | 32                  | 2.1                                 | 20                    | 0.8                                    |
| 2009           | 19                    | 24                   | 9                       | 53                  | 2.8                                 | 13                    | 0.54                                   |
| 2010           | 16                    | 23                   | 9                       | 38                  | 2.2                                 | 17                    | 0.74                                   |
| <b>2011</b>    | <b>14</b>             | <b>16</b>            | <b>10</b>               | <b>38</b>           | <b>2.7</b>                          | <b>21</b>             | <b>1.31</b>                            |
| <b>Average</b> | 10.4                  | 12.9                 | 6.7                     | 35.4                | 2.07                                | 14.8                  | 1.3                                    |

**Table 2: Historic Productivity of Piping Plovers on FIIS**

| Nest #                                              | Location                   | # Eggs Laid | # Chicks Hatched | # Chicks Fledged | Result         |
|-----------------------------------------------------|----------------------------|-------------|------------------|------------------|----------------|
| 1A                                                  | Lighthouse (east)          | 4           | 4                | 4                | FLEDGED        |
| 2A                                                  | Point O'Woods              | 4           | 4                | 1                | FLEDGED        |
| 3A                                                  | Wilderness (section 4)     | 4           | 0                | 0                | Buried         |
| 3B                                                  | Wilderness (section 4)     | 4           | 4                | 1                | FLEDGED        |
| 4A                                                  | Wilderness (section 8)     | 4           | 3                | 3                | FLEDGED        |
| 5A                                                  | Wilderness (section 7)     | 4           | 4                | 1                | FLEDGED        |
| 6A                                                  | Robbins Rest<br>(NPS land) | 4           | 3                | 3                | FLEDGED        |
| 7A                                                  | Wilderness (section 10)    | 4           | 4                | 2                | FLEDGED        |
| 8A                                                  | Wilderness (section 6)     | 4           | 0                | 0                | Predated       |
| 8B                                                  | Wilderness (section 7)     | 4           | 0                | 0                | Overwashed     |
| 9A                                                  | Wilderness (section 9)     | 4           | 2                | 0                | Hatched/Failed |
| 10A                                                 | Lighthouse (west)          | 3           | 3                | 1                | FLEDGED        |
| 11A                                                 | Wilderness (section 7)     | 4           | 3                | 2                | FLEDGED        |
| 12A                                                 | Point O'Woods              | 3           | 0                | 0                | Predated       |
| 13A                                                 | Wilderness (section 9)     | 4           | 4                | 3                | FLEDGED        |
| 14A                                                 | Wilderness (section 7)     | 2           | 0                | 0                | Predated       |
| <b>Totals</b>                                       |                            | <b>60</b>   | <b>38</b>        | <b>21</b>        |                |
| <b>Productivity (chicks fledged per pair) = 1.5</b> |                            |             |                  |                  |                |

Table 3: FIIS 2011 Overall Piping Plover productivity

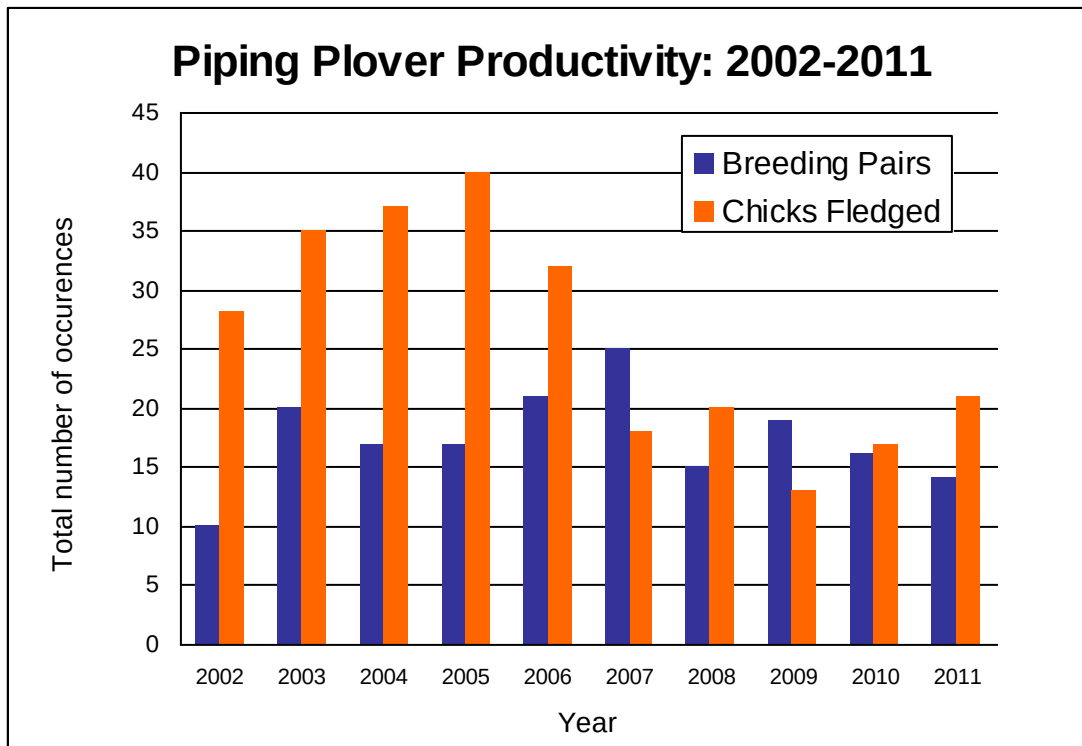


**Figure 1: The number of Piping Plover breeding pairs and the number of chicks fledged at FIIS, 2002-2011**

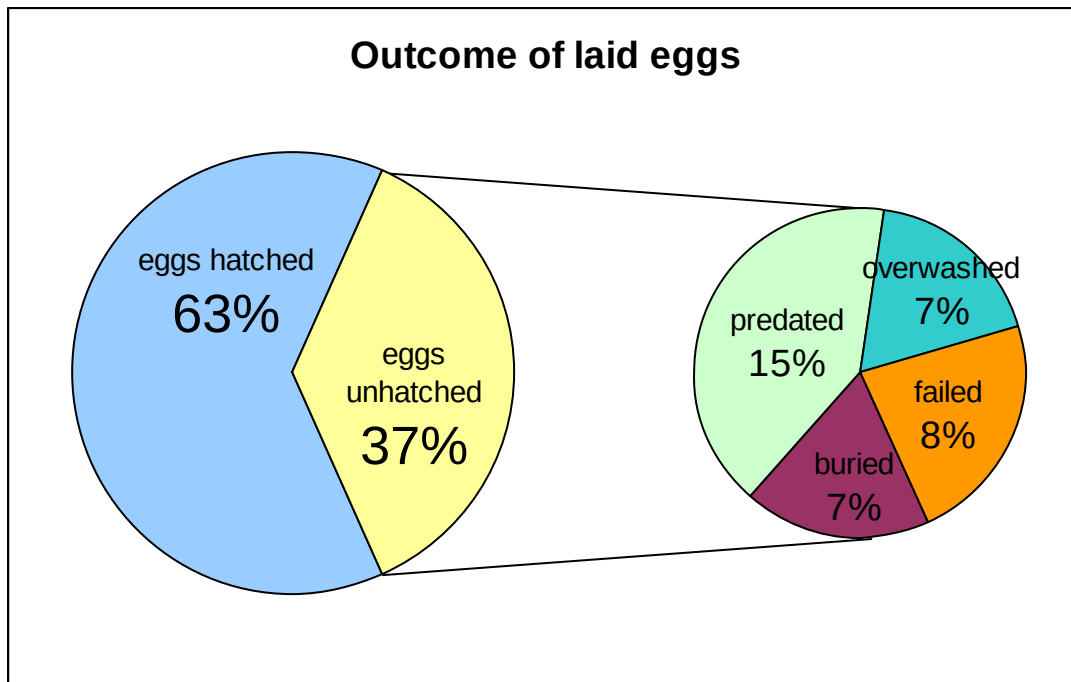


Figure 2: Pie graph displaying the outcome of all laid Piping Plover eggs at FIIS in 2011

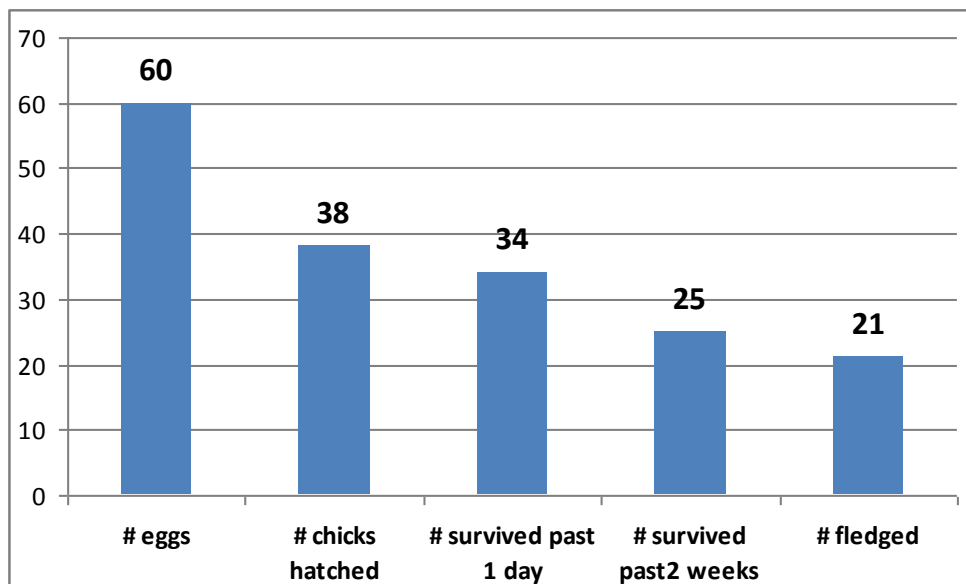


Figure 3: Bar graph of brood outcome for 2011 Piping Plovers at FIIS

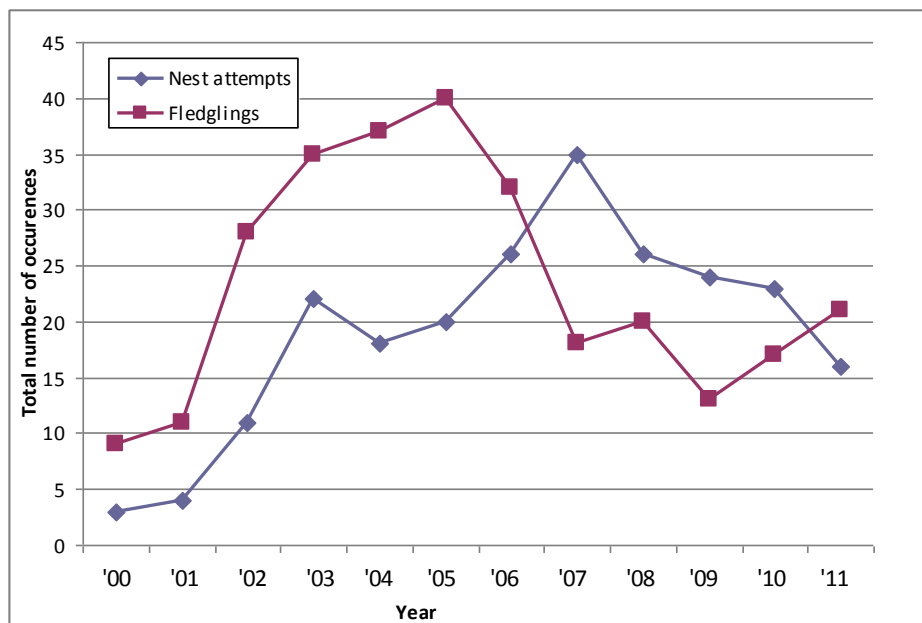


**Figure 4: Chart displaying historical values for Piping Plover nests & fledglings on FIIS (2000-2011)**



**Figure 5: Chart displaying historical values for Seabeach Amaranth & Seabeach Knotweed on FIIS (2003-2011)**

| Survey Window                                                                  | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | Additional Observations: |                                       |                                                     |
|--------------------------------------------------------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|--------------------------|---------------------------------------|-----------------------------------------------------|
| Site                                                                           | COTE |     | LETE |     | AMOY |     | WILL |     | OSPR |     | GREG |     | GLIB |     | DCCO |     | GBBG |     | HEGU                     |                                       |                                                     |
| Islip Spoil Island                                                             |      |     |      |     |      |     |      |     |      |     | 6    |     | 16   |     |      |     | 240  |     | 160                      | 1st: not surveyed 2nd: 1 BCNH, 3 SNEG |                                                     |
| Sexton Island                                                                  | 80   | 10  |      |     | 2    |     |      |     | 1    | 2   |      |     |      |     | 6    | 16  |      |     | 45                       | 122                                   | 1st: 110 LAGU 2nd:140 LAGU, 1SNEG                   |
| East Fire Island                                                               | 45   | 4   | 0    | 16  | 6    | 2   | 6    | 2   |      |     | 0    | 5   |      |     | 24   | 0   |      |     |                          |                                       | 1st: 2 SNEG 2nd: 2 GRBH                             |
| Long Cove                                                                      | 145  | 300 |      |     | 2    | 0   | 6    | 0   |      |     |      |     |      |     |      |     |      |     | 2                        | 0                                     | 1st: 1 SNEG                                         |
| Ridge Island                                                                   | 500  | 250 |      |     |      |     | 0    | 1   |      |     |      |     |      |     | 16   | 23  | 54   | 62  | 100                      | 150                                   | 1st: 2 LIBH, 1 BCNH, 1 SNEG 2nd: 1 LIBH, and 1 SNEG |
| Pelican Island                                                                 |      |     |      |     |      |     |      |     | 2    | 2   |      |     |      |     |      |     | 0    | 2   | 0                        | 6                                     |                                                     |
| John Boyle Island                                                              |      |     |      |     | 4    | 1   |      | 1   |      |     | 4    | 2   | 4    | 46  |      |     | 30   | 8   | 80                       | 92                                    |                                                     |
| Hospital Island                                                                |      |     |      |     |      |     |      |     |      |     |      |     |      |     | 0    | 2   | 0    | 2   |                          |                                       |                                                     |
| Fire Island Villages                                                           |      |     | 6    | 47  |      |     |      |     |      |     |      |     |      |     |      |     |      |     |                          |                                       | 1st: 11 MALL 2nd: 2 MALL, 3 SNEG                    |
| Watch Hill Bay                                                                 |      |     |      |     |      |     | 2    | 1   | 1    | 0   | 1    | 4   | 1    | 1   |      |     |      |     |                          |                                       |                                                     |
| OPWA*                                                                          |      |     | 54   | 15  |      |     |      |     |      |     |      |     |      |     |      |     |      |     |                          |                                       |                                                     |
| Inactive Sites: Lighthouse, Sailors Haven, West Fire Island, Fire Island Pines |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |                          |                                       |                                                     |

**Table 4:** Long Island Colonial Waterbird Surveys for the 2011 season at FIIS. Sites are listed from west to east and separated by whether they are bay islands or on Fire Island. Species codes: COTE = Common Tern, LAGU= Laughing Gull, AMOY = American Oystercatcher, DCCO = Double Crested Cormorant, LETE= Least Tern, WILL = Willet, GBBG = Great Black-Backed Gull, OSPR = American Osprey, GLIB = Glossy Ibis, GREG = Great Egret, SNEG = Snowy Egret, HEGU = Herring Gull, MALL = Mallard, BCNH = Black Crowned Night Heron, LIBH = Little Blue Heron, GRBH = Great Blue Heron (\* = Davis Park included in Wilderness survey)

## Appendix B: Maps



### Map 1: Map of Fire Island National Seashore

**Maps 2 - 6: Maps of threatened and endangered species' locations in 2011 by Long Island Colonial Waterbird Survey areas. Locations include piping plover nests, seabeach amaranth and seabeach knotweed individuals.**

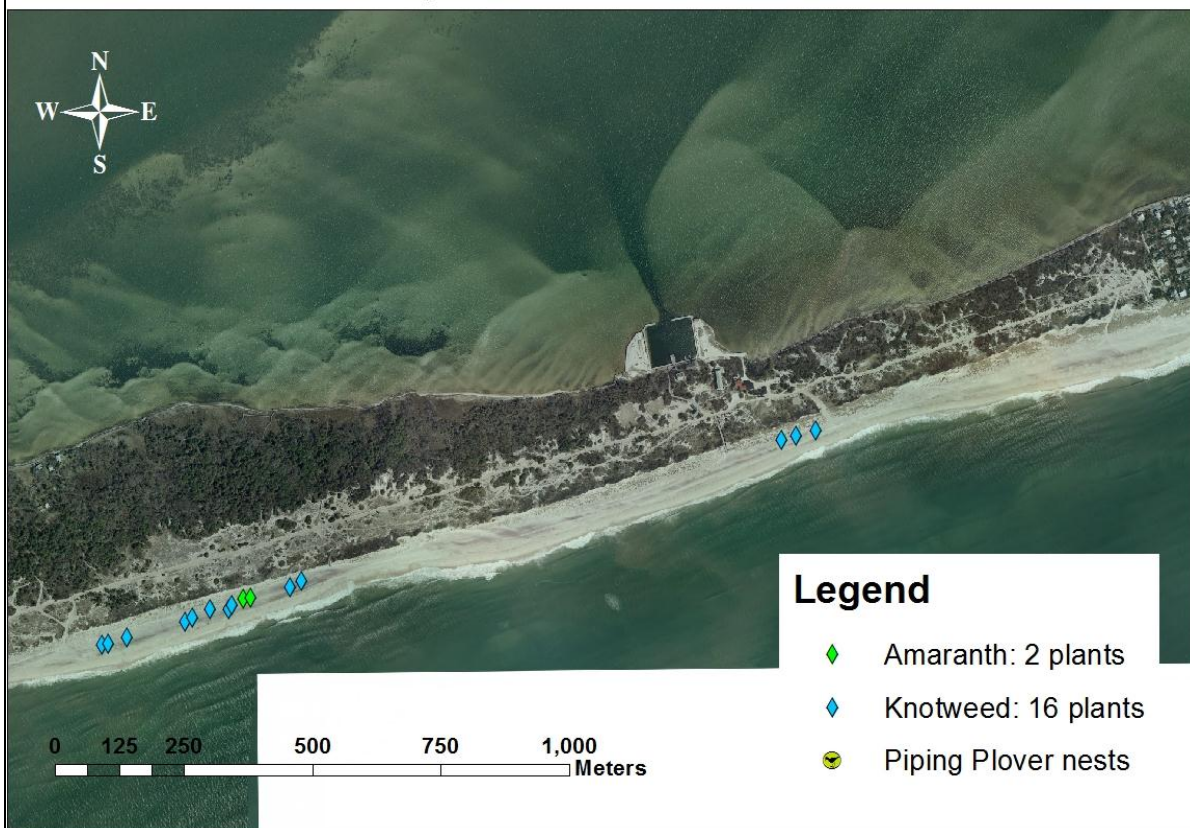
## 2011 T&E Species - Fire Island Lighthouse



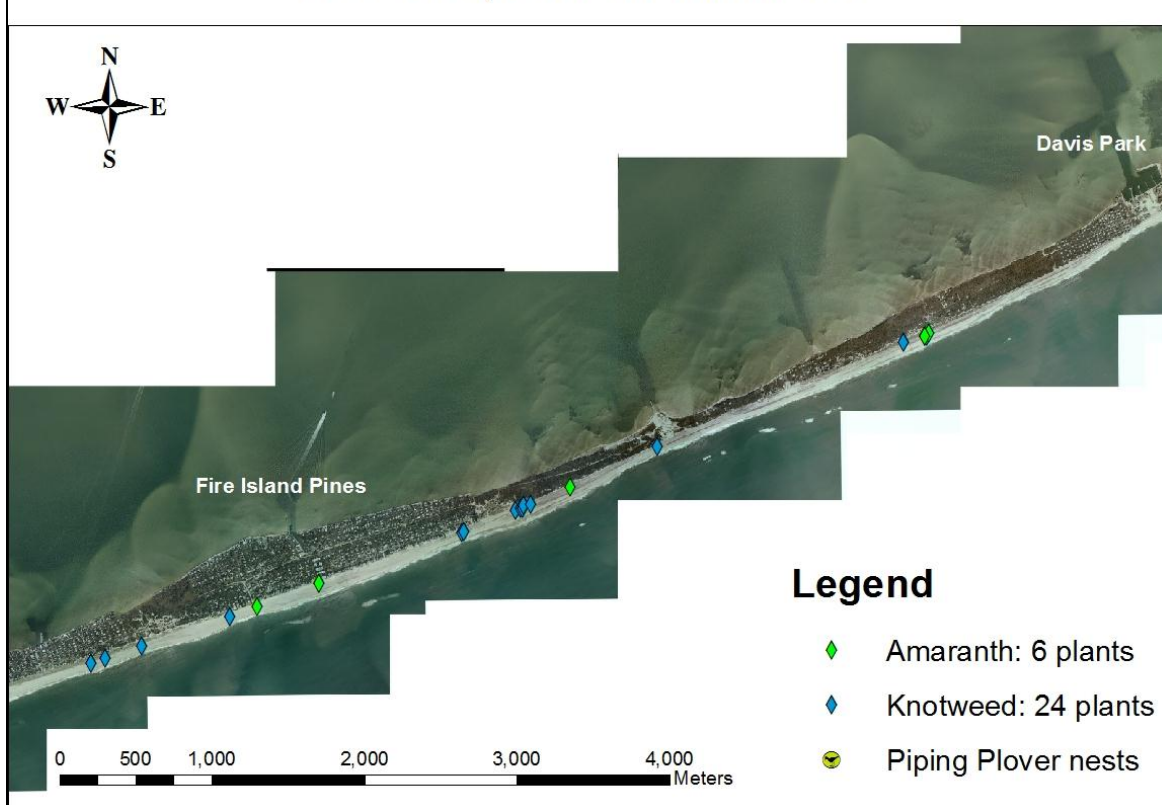
## 2011 T&E Species: Fire Island Villages

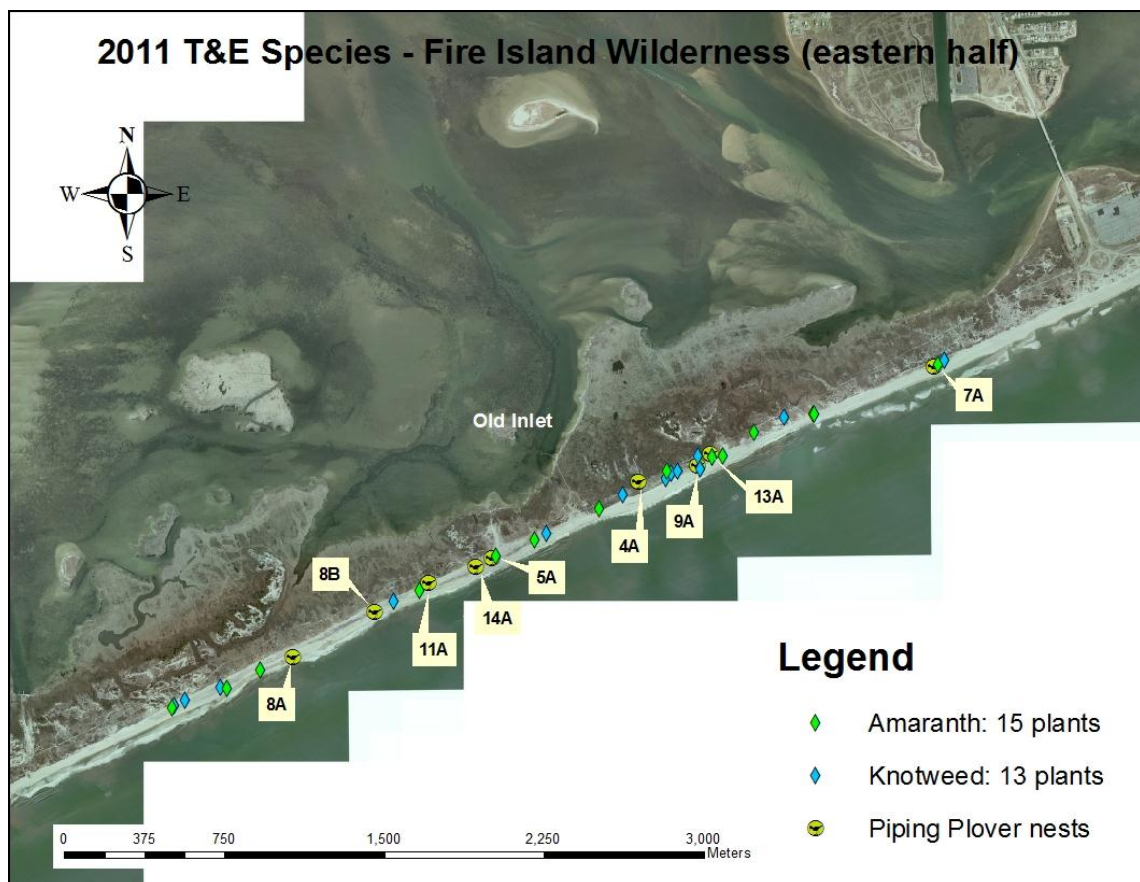
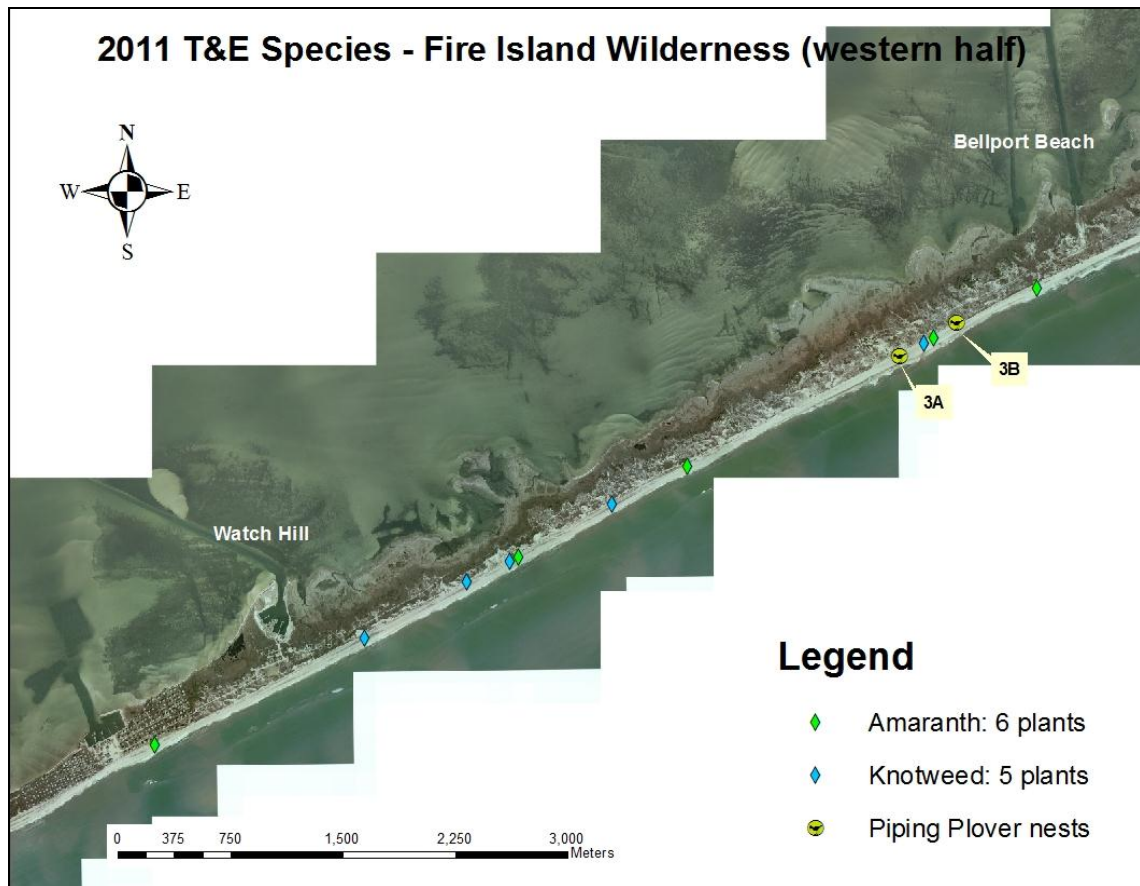


### 2011 T&E Species: Fire Island Sunken Forest



### 2011 T&E Species: Fire Island Pines





## Appendix B: GPS locations

### 1. Piping Plover Nests

| Nest   | LICWS site name        | Location Description    | UTMs (x) | UTMs (y) | productivity |
|--------|------------------------|-------------------------|----------|----------|--------------|
| 1A-11  | Fire Island Lighthouse | Lighthouse (east)       | 651424   | 4499424  | 4            |
| 2A-11  | Fire Island Villages   | Point O'Woods           | 658494   | 4501678  | 1            |
| 3A-11  | Fire Island Wilderness | Wilderness (section 4)  | 673998   | 4508314  | 0            |
| 3B-11  | Fire Island Wilderness | Wilderness (section 4)  | 674379   | 4508536  | 1            |
| 4A-11  | Fire Island Wilderness | Wilderness (section 8)  | 678073   | 4510314  | 3            |
| 5A-11  | Fire Island Wilderness | Wilderness (section 7)  | 677385   | 4509954  | 1            |
| 6A-11  | Fire Island Villages   | Robbins Rest (NPS land) | 655128   | 4500641  | 3            |
| 7A-11  | Fire Island Wilderness | Wilderness (section 10) | 679459   | 4510854  | 2            |
| 8A-11  | Fire Island Wilderness | Wilderness (section 6)  | 676454   | 4509488  | 0            |
| 8B-11  | Fire Island Wilderness | Wilderness (section 7)  | 676835   | 4509700  | 0            |
| 9A-11  | Fire Island Wilderness | Wilderness (section 9)  | 678348   | 4510388  | 0            |
| 10A-11 | Fire Island Lighthouse | Lighthouse (west)       | 650217   | 4499095  | 1            |
| 11A-11 | Fire Island Wilderness | Wilderness (section 7)  | 677089   | 4509838  | 2            |
| 12A-11 | Fire Island Villages   | Point O'Woods           | 658377   | 4501625  | 0            |
| 13A-11 | Fire Island Wilderness | Wilderness (section 9)  | 678411   | 4510441  | 3            |
| 14A-11 | Fire Island Wilderness | Wilderness (section 7)  | 677311   | 4509912  | 0            |

## 2. Seabeach amaranth individuals

| Site Name (LICWS)         | Location Description           | UTMs (x) | UTMs (y) | # of plants | max size (cm) | Evidence of Browsing (date(s)/none) | Reproductive (date(s)/none) |
|---------------------------|--------------------------------|----------|----------|-------------|---------------|-------------------------------------|-----------------------------|
| Fire Island Lighthouse    | Lighthouse beach               | 650547   | 4499162  | 1           | 10.5          | 8/16                                | 8/1                         |
| Fire Island Lighthouse    | Lighthouse beach               | 650891   | 4499259  | 1           | 19.0          | 8/16                                |                             |
| Fire Island Lighthouse    | Lighthouse beach               | 651662   | 4499488  | 1           | 13.5          |                                     |                             |
| Fire Island Lighthouse    | Lighthouse beach               | 651293   | 4499378  | 1           | 7             |                                     |                             |
| Fire Island Pines         | Blue Point                     | 667290   | 4504844  | 1           | 13.0          | 8/1                                 |                             |
| Fire Island Pines         | Blue Point                     | 667261   | 4504823  | 1           | 3.0           |                                     |                             |
| Fire Island Pines         | Talisman                       | 664940   | 4503836  | 1           | 11.5          |                                     |                             |
| Fire Island Pines         | Fire Island Pines              | 662884   | 4503053  | 1           | 23            | 7/27                                |                             |
| Fire Island Pines         | Fire Island Pines              | 663285   | 4503202  | 1           | 25            | 8/11                                |                             |
| Fire Island Pines         | Fire Island Pines              | 663287   | 4503202  | 1           | 10            | 8/11                                |                             |
| Fire Island Sunken Forest | Sailor's Haven                 | 659397   | 4501963  | 1           | 5.0           | 8/1                                 |                             |
| Fire Island Sunken Forest | Sailor's Haven                 | 659411   | 4501965  | 1           | 11.0          | 8/1; 8/25                           |                             |
| Fire Island Villages      | Robbin's Rest                  | 654984   | 4500609  | 1           | 12.0          | 8/25                                |                             |
| Fire Island Villages      | Robbin's Rest                  | 655067   | 4500633  | 1           | 24.5          | 7/20; 8/25                          |                             |
| Fire Island Villages      | Robbin's Rest                  | 655100   | 4500638  | 1           | 16.5          | 8/25                                |                             |
| Fire Island Villages      | Dunewood                       | 653990   | 4500275  | 1           | 13            |                                     |                             |
| Fire Island Villages      | Seaview                        | 656325   | 4500956  | 1           | 3             |                                     |                             |
| Fire Island Villages      | Point O'Woods                  | 658209   | 4501591  | 1           | 15            |                                     |                             |
| Fire Island Villages      | Point O'Woods                  | 658557   | 4501658  | 1           | 18            |                                     |                             |
| Fire Island Wilderness    | Watch Hill - Bellport Beach    | 674222   | 4508434  | 1           | 11.0          |                                     |                             |
| Fire Island Wilderness    | Bellport Beach - Wilderness VC | 675886   | 4509254  | 1           | 15.5          | 7/19; 8/4; 8/24                     |                             |
| Fire Island Wilderness    | Bellport Beach - Wilderness VC | 676299   | 4509426  | 1           | 6.0           | 8/4; 8/24                           |                             |
| Fire Island Wilderness    | Bellport Beach - Wilderness VC | 677408   | 4509961  | 1           | 16.0          | 8/4; 8/24                           |                             |
| Fire Island Wilderness    | Bellport Beach - Wilderness VC | 677588   | 4510040  | 1           | 7.0           | 8/24                                |                             |
| Fire Island Wilderness    | Bellport Beach - Wilderness VC | 678209   | 4510363  | 1           | 7.0           |                                     |                             |
| Fire Island Wilderness    | Watch Hill - Bellport Beach    | 671454   | 4506976  | 1           | 17.0          |                                     |                             |
| Fire Island Wilderness    | Watch Hill - Bellport Beach    | 672584   | 4507582  | 1           | 34.0          |                                     | 8/24                        |
| Fire Island Wilderness    | Watch Hill - Bellport Beach    | 674915   | 4508765  | 1           | 28.5          | 8/4; 8/24                           |                             |
| Fire Island Wilderness    | Watch Hill - Bellport Beach    | 676146   | 4509344  | 1           | 12.5          |                                     |                             |
| Fire Island Wilderness    | Bellport Beach - Wilderness VC | 677048   | 4509800  | 1           | 17.0          | 8/24                                |                             |

|                        |                                |        |         |   |      |           |      |
|------------------------|--------------------------------|--------|---------|---|------|-----------|------|
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 678418 | 4510427 | 3 | 6.5  |           | 8/24 |
| Fire Island Wilderness |                                | 678418 | 4510427 |   | 3.0  |           |      |
| Fire Island Wilderness |                                | 678418 | 4510427 |   | 1.5  |           |      |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 678469 | 4510432 | 1 | 6.5  | 8/4; 8/24 |      |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 678617 | 4510546 | 1 | 7.0  | 8/24      |      |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 678897 | 4510628 | 1 | 15.5 | 8/4; 8/24 |      |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 678898 | 4510629 | 1 | 6.0  | 8/4       | 8/4  |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 679479 | 4510860 | 1 | 10.0 | 8/24      | 8/4  |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 677889 | 4510187 | 1 | 9.5  |           | 8/24 |
| Fire Island Wilderness | Davis Park                     | 669023 | 4505726 | 1 | 5    |           |      |

### 3. Seabeach knotweed individuals

| Site Name (LICWS)      | Location Description | Date   | UTMs (x) | UTMs (y) | # of plants |
|------------------------|----------------------|--------|----------|----------|-------------|
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650281   | 4499082  | 2           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650290   | 4499094  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650303   | 4499087  | 3           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650309   | 4499097  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650473   | 4499135  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650566   | 4499170  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650800   | 4499233  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650817   | 4499244  | 24          |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650827   | 4499240  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650858   | 4499257  | 3           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650889   | 4499260  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650914   | 4499256  | 2           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650917   | 4499254  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650928   | 4499265  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650949   | 4499274  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650967   | 4499307  | 18          |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650978   | 4499276  | 3           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 650985   | 4499285  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 651010   | 4499291  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 651018   | 4499300  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 651152   | 4499337  | 4           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 651494   | 4499430  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 651534   | 4499444  | 1           |
| Fire Island Lighthouse | Lighthouse beach     | 8/1/11 | 651577   | 4499456  | 3           |

|                           |                    |        |        |         |   |
|---------------------------|--------------------|--------|--------|---------|---|
| Fire Island Lighthouse    | Lighthouse beach   | 8/1/11 | 651595 | 4499459 | 1 |
| Fire Island Lighthouse    | Lighthouse beach   | 8/1/11 | 651646 | 4499481 | 2 |
| Fire Island Lighthouse    | Lighthouse beach   | 8/1/11 | 651653 | 4499489 | 2 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 654930 | 4500592 | 3 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 654934 | 4500591 | 3 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 654984 | 4500604 | 1 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 655057 | 4500623 | 3 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 655069 | 4500630 | 3 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 655075 | 4500636 | 1 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 655099 | 4500642 | 2 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 655104 | 4500649 | 1 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 655100 | 4500638 | 1 |
| Fire Island Villages      | Robbins Rest (NPS) | 8/1/11 | 655156 | 4500662 | 1 |
| Fire Island Villages      | Seaview            | 8/5/11 | 656634 | 4501045 | 2 |
| Fire Island Villages      | Ocean Bay Park     | 8/5/11 | 657091 | 4501189 | 1 |
| Fire Island Villages      | Ocean Bay Park     | 8/5/11 | 657104 | 4501200 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659121 | 4501874 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659133 | 4501876 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659169 | 4501889 | 2 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659282 | 4501919 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659297 | 4501926 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659332 | 4501943 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659368 | 4501944 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659374 | 4501951 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659487 | 4501985 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 659509 | 4501997 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 660443 | 4502270 | 3 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 660472 | 4502279 | 1 |
| Fire Island Sunken Forest | Sailors Haven      | 8/5/11 | 660511 | 4502288 | 1 |
| Fire Island Pines         | Cherry Grove       | 8/5/11 | 661792 | 4502679 | 1 |
| Fire Island Pines         | Cherry Grove       | 8/5/11 | 661886 | 4502714 | 1 |
| Fire Island Pines         | Carrington Tract   | 8/5/11 | 662123 | 4502791 | 1 |
| Fire Island Pines         | Fire Island Pines  | 8/5/11 | 662701 | 4502984 | 1 |
| Fire Island Pines         | Fire Island Pines  | 8/5/11 | 664225 | 4503535 | 1 |
| Fire Island Pines         | Fire Island Pines  | 8/5/11 | 664238 | 4503541 | 1 |
| Fire Island Pines         | Talisman           | 8/5/11 | 664577 | 4503680 | 1 |
| Fire Island Pines         | Talisman           | 8/5/11 | 664612 | 4503692 | 3 |
| Fire Island Pines         | Talisman           | 8/5/11 | 664622 | 4503697 | 1 |
| Fire Island Pines         | Talisman           | 8/5/11 | 664633 | 4503712 | 2 |
| Fire Island Pines         | Talisman           | 8/5/11 | 664678 | 4503721 | 2 |
| Fire Island Pines         | Talisman           | 8/5/11 | 665507 | 4504102 | 1 |
| Fire Island Pines         | Blue Point         | 8/5/11 | 667127 | 4504782 | 1 |
| Fire Island Pines         | Blue Point         | 8/5/11 | 667261 | 4504824 | 1 |

|                        |                                |        |        |         |   |
|------------------------|--------------------------------|--------|--------|---------|---|
| Fire Island Pines      | Blue Point                     | 8/5/11 | 667267 | 4504833 | 1 |
| Fire Island Pines      | Blue Point                     | 8/5/11 | 667275 | 4504828 | 1 |
| Fire Island Pines      | Blue Point                     | 8/5/11 | 667265 | 4504828 | 4 |
| Fire Island Wilderness | Watch Hill - Bellport Beach    | 8/4/11 | 670430 | 4506440 | 1 |
| Fire Island Wilderness | Watch Hill - Bellport Beach    | 8/4/11 | 671110 | 4506808 | 1 |
| Fire Island Wilderness | Watch Hill - Bellport Beach    | 8/4/11 | 671396 | 4506945 | 1 |
| Fire Island Wilderness | Watch Hill - Bellport Beach    | 8/4/11 | 672078 | 4507325 | 1 |
| Fire Island Wilderness | Watch Hill - Bellport Beach    | 8/4/11 | 674161 | 4508396 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 675896 | 4509262 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 675946 | 4509287 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 676115 | 4509350 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 676927 | 4509749 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 677644 | 4510069 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 678003 | 4510249 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 678205 | 4510325 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 678228 | 4510350 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 678257 | 4510360 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 678365 | 4510374 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 678357 | 4510434 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 678760 | 4510612 | 1 |
| Fire Island Wilderness | Bellport Beach - Wilderness VC | 8/4/11 | 679509 | 4510883 | 1 |