

**Fire Island National Seashore**

**THREATENED & ENDANGERED SPECIES  
MONITORING PROGRAM  
2013 SUMMARY**



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# THREATENED & ENDANGERED SPECIES MONITORING PROGRAM 2013 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 2013. Through daily monitoring and a collaborative park effort, a total of 11 piping plover (*Charadrius melodus*) nesting pairs were recorded within the park. With a total of 7 successful piping plover fledglings, nesting productivity reached an average of 0.64 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. Fifteen seabeach amaranth (*Amaranthus pumilus*) and 91 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.

This is the first nesting season after Hurricane Sandy (October 2012), which caused major overwashes throughout Fire Island but most notably at Lighthouse Beach and east of the Old Inlet Area in the Wilderness, where a breach formed and still remains. Virginia Tech – with Dr. James Fraser as the PI – also began a multi-year study in 2013 titled, “*Response of Piping Plovers and their Invertebrate Prey to Habitats Created by Hurricane Sandy*”. The study involves intense monitoring of piping plovers, including banding of all adults and chicks. FIIS staff worked closely with both Virginia Tech researchers, as well as LUES staff, to monitor and protect piping plovers across Fire Island. This was also the first year that small exclosures were placed around seabeach amaranth individuals to protect them from white-tailed deer browsing. Several natural and human-induced disturbances that occurred this year will also 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.

Hurricane Sandy in October 2012 caused a breach in the Old Inlet area and this breach remains open and dynamic. Practically the entire area near Lighthouse Beach and east of the breach (OPWA East) was overwashed from Hurricane Sandy, which can be seen in the aerial photography used to produce the maps in Appendix B.

### **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 2013 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 2013, 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.

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, the FIIS Wildlife Biologist assisted the USFWS Biologist and Land Use Ecological Services (LUES) staff with deciding which areas were suitable 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, scraping, 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 FIIS 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-13).

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. 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**

In 2013 there were two different kinds of surveys conducted: a Gull/Wading Bird survey and Tern and Black Skimmer surveys. The survey window for Gull/Wading Bird survey is May 17-31 and the Tern and Black Skimmer surveys are conducted twice every year in June, with the first survey window June 1-15, and the second survey window 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. All plants located outside of existing symbolic fencing are 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. Due to the increased rarity of amaranth plants, exclosures were added to several plants this year to prevent herbivory.

## **6. RESULTS**

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

Monitoring for the 2013 piping plover breeding season on Fire Island began when the first piping plovers were observed in early April and continued through the end of August. In the months between May and July, piping plover nests were discovered and documented throughout FIIS.

A total of 11 nesting pairs were documented, from which there came 13 nesting attempts throughout FIIS. Nine nests hatched and 3 nests successfully fledged chicks. Nests were lost due to overwash, predation, and nest abandonment for unidentified reasons (Table 3).

A total of 51 eggs were laid and of these 34 total eggs hatched, with the remainder failing as a result of predation or other circumstances (Figure 2). Seven chicks went on to fledge, yielding a productivity of 0.64 for 11 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 (Figure 3). Maps of nest locations can be located in Appendix B. More detailed information in regards to the Virginia Tech study can be found in their Annual Report from 2013 (reference is in Works Cited section).

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

A summary of plover nest activity on Fire Island west of the Otis Pike Fire Island High Dune Wilderness (OPWA) is as follows: 1 nesting pair at Sailor's Haven (4A), and 1 at Lighthouse Beach (5A).

The OPWA yielded 9 plover pairs and 10 nesting attempts which were divided by location: OPWA West (Watch Hill to Old Inlet) and OPWA East (Old Inlet to the Wilderness Visitor Center). There were 5 nesting pairs in OPWA West (3A, 6A, 8A, 9A, 10A). In the OPWA East there were 4 nesting pairs (1A, 2A, 2B, 7A, 11A). Below is a summary of each attempt:

Nest **1A-13** was found on May 6<sup>th</sup> with 2 eggs in OPWA-East, in Section 9, far back in the overwash. FIIS staff attempted to exclose the nest, but the adult was not regularly incubating. It was exclosed on May 15<sup>th</sup> with a full clutch of 4 eggs. On June 5<sup>th</sup>, two chicks hatched and 2 eggs remained. A red fox attempted to dig under the exclosure. VA Tech staff observed 3 chicks on June 6<sup>th</sup>, with one chick running around in the overwash and two still in the nest. All eggs hatched but only three chicks were observed up until June 10<sup>th</sup>. Two days later, one chick was found dead; none were seen alive.

Nest **2A-13** was discovered on May 13<sup>th</sup> in OPWA-East, in Section 8, close to the symbolic fencing. The number of eggs on May 13<sup>th</sup> is unknown because it was extremely windy and FIIS staff did not want to disturb the incubating bird. The nest was exclosed on May 15<sup>th</sup> with 4 eggs. On June 5<sup>th</sup>, VA Tech staff

reported starring on the eggs. However, on June 10<sup>th</sup> the nest was found to be overwashed by the high tides of a tropical storm.

Nest **2B-13** was located in OPWA-East, in Section 9, back in the overwash near a walking corridor from the wilderness area. It was found on June 20<sup>th</sup> with 3 eggs and exclosed the same day. The walking corridor was also closed. On July 2<sup>nd</sup>, no adults were observed and the nest was declared abandoned. Fox tracks were seen around the enclosure.

Nest **3A-13** was found in OPWA-West at Long Cove, in Section 2. It was exclosed the same day it was discovered, May 17<sup>th</sup>, with a full clutch of 4 eggs. VA Tech staff reported cracks in one egg on June 5<sup>th</sup>. On June 8<sup>th</sup> two chicks were seen, no eggshells were found in the nest (all eggs hatched), and a fox had made digging attempts around the enclosure. The two chicks went on to fledge.

Nest **4A-13** was located in Sailors Haven, east of the Oakleyville driving cut. It was found with one egg on May 21<sup>st</sup>, and exclosed with 2 eggs on May 24<sup>th</sup>. Extreme high tides from a tropical storm washed out the nest on June 8<sup>th</sup>. The birds did not re-nest.

Nest **5A-13** was found at Lighthouse Beach, west of the Kismet cut, on the east end of the eastern overwash. It was found with 2 eggs on May 21<sup>st</sup> and exclosed with 3 eggs on May 24<sup>th</sup>. On June 18<sup>th</sup>, two chicks hatched and two eggs remained in the nest. One of the remaining eggs hatched out, but still only two chicks were observed. One egg remained unhatched, and two chicks were seen up until June 25<sup>th</sup>. No chicks were seen after June 28<sup>th</sup>.

Nest **6A-13** was discovered in OPWA-West, in Section 5, west of Bellport Beach. It was exclosed with 4 eggs the same day it was found on May 22<sup>nd</sup>. On June 11<sup>th</sup>, two chicks had hatched and were still in the nest while two eggs remained unhatched. On the following day, four chicks were observed. On June 17<sup>th</sup>, no chicks were seen.

Nest **7A-13** was found on May 28<sup>th</sup> with a clutch of five eggs located in OPWA-East, far back in the overwash near the bayside, in Section 8. It was exclosed on May 30<sup>th</sup>. Four eggs were seen in the nest on June 16<sup>th</sup>. Three eggs had hatched by June 24<sup>th</sup>. No chicks were seen until the final egg hatched on June 26<sup>th</sup>. However, this chick did not survive.

Nest **8A-13** was found on May 28<sup>th</sup> with a clutch of 3 eggs and exclosed that same day. It was located in OPWA-West, in Section 5, just east of Bellport Beach. All four eggs hatched on June 26<sup>th</sup>. One chick was observed with adults on July 2<sup>nd</sup> and was continually seen until it fledged.

Nest **9A-13** was discovered on May 29<sup>th</sup> with one egg in OPWA-West, in Section 3. It was exclosed as a full clutch of 4 eggs on June 4<sup>th</sup>. On July 2<sup>nd</sup>, all eggs hatched, but no chicks or adults were seen. There was extensive digging around this enclosure with fox scat and scent surrounding the area.

Nest **10A-13** was located on a flood shoal on the bayside of OPWA-West not accessible by foot, northwest of the breach. It was found on June 1<sup>st</sup>. On June 5<sup>th</sup>, FIIS staff was able to reach the area by boat and confirmed the nest, with 3 eggs. Symbolic fencing was established, but the nest was not exclosed. On June 11<sup>th</sup>, FIIS staff observed a nest exchange. However, on June 12<sup>th</sup> no eggs or adults

when the flood shoal was accessed by boat. The nest was either overwashed (strong North winds on June 11<sup>th</sup>) or predated.

**Nest 10B-13** was found with 4 eggs on July 12<sup>th</sup> in OPWA-West, in Section 6, just east of Bellport Beach. VA-Tech researchers determined the eggs to be 20 days old. The nest was left un-excused. Three chicks hatched by July 20<sup>th</sup>, but the 4<sup>th</sup> egg never hatched and none of the chicks were seen on or after July 26<sup>th</sup>. An adult fox was seen near the nest the day no chicks were found.

**Nest 11A-13** was found with 2 eggs on June 19<sup>th</sup> in OPWA-East, in Section 8, just east of the breach. It was excused on June 20<sup>th</sup> with 3 eggs. It soon became a full clutch, and all four chicks hatched around July 17<sup>th</sup>. The adults moved their brood to the bayside, near 7A-13, where all four chicks were observed until their fledge date.

#### **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. In total, 14 of the 15 sites were surveyed (Table 4), which include 9 bay islands and 6 sections of Fire Island. Sexton Island was the only site not surveyed in 2013. In addition, some sites were not surveyed during the official Gull/Wading Bird survey window (May 17-31).

No ROTE or BLSK were observed during any of the LICWS surveys, which is similar to past years. COTE colonies were observed in the following areas at fairly high numbers: East Fire Island (max. of 232), Long Cove (max. of 420), and Ridge Island (max. of 490). A LETE colony was only detected on East Fire Island in 2013; no LICWS sites on Fire Island itself supported LETE colonies. In 2012 only one fledged LETE chick was observed in Point O'Woods out of several other colonies that were detected throughout the survey windows. Extensive LETE colonies were expected with the increase in suitable nesting habitat caused by Hurricane Sandy. The trends in COTE and LETE colonies should be analyzed further and recommendations/suggestions made by the FIIS Wildlife Biologist for ways to increase suitable nesting habitat. Please refer to Tables 4 and 5 for more specific numbers and information by site.

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

A total of 15 seabeach amaranth plants were found in several sweep counts on FIIS throughout July, August and September (Figure 5). Staff surveyed for amaranth plants during 2 survey windows: 1) July 31 – August 10, and 2) August 20 – 31. Plants still alive were surveyed again in late-September and up until senescence. Sites from the LICWS were recognized and reported as such for seabeach amaranth: Fire Island Lighthouse (0 plants), Fire Island Villages (9 plants), Fire Island Sunken Forest (0 plants), Fire Island Pines (5 plants), and the Fire Island Wilderness (1 plant).

Eight out of the 15 amaranth plants found were excused to protect them from herbivory, presumably from white-tailed deer (*Odocoileus virginianus*). A few were still excused after extensive browsing had

already occurred, and recovery did occur. A mixture of large and small plants was observed with the average size being 22.1 cm in diameter at the widest point. The smallest plant only grew to 7.5 cm and the largest plant grew to 60.0 cm. Nine out of 15 plants showed signs of reproduction (60% of plants). The majority of plants were located inside the symbolic fenced areas designated initially for piping plovers, but some fencing had to be added around other individuals. A majority of the plants were still alive in mid-September.

Surveying for seabeach knotweed was concurrent with that for seabeach amaranth during the survey windows. A total of 91 knotweed plants were counted and marked throughout FIIS (Figure 5). Sites found with knotweed include Fire Island Lighthouse (8 plants), Fire Island Villages (32 plants), Fire Island Sunken Forest (3 plants), Fire Island Pines (44 plants) and Fire Island Wilderness (4 plants). Both federal and non-federal tracts of land were surveyed in 2013. Most of the plants were a mix of large and small sizes and located inside the symbolically fenced areas designated initially for piping plovers.

All vegetation data – including GPS coordinates, measurements and observations - is located in Appendix C.

## **7. DISCUSSION**

### **7a. DISTURBANCE ISSUES IN 2013**

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

There were several anthropogenic and natural disturbances to T&E species in 2013. 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 several days prior to the hatching of a piping plover nest.

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 meters 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. Plover pairs at Lighthouse Beach and Sailors Haven were not successful, so driving closures were not in effect for very long in these areas. Once the first nest hatched in the Wilderness the beach was closed to NPS full-sized vehicles (unless there was an emergency situation).

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. Feral and domesticated cats living within the communities in previous years may have posed a threat to plovers. Cats act as predators and will hunt and harass nesting birds and chicks. This season no cat tracks were observed near plover nests.

#### **7a. 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. American oystercatchers (*Haematopus palliatus*) nested on Lighthouse beach in 2012 and acted territorial towards breeding piping plovers; however, none were observed in 2013.

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 predator exclosures. Evidence and sightings of red fox was especially prevalent in the OPWA. Red fox tracks were often observed at the toe of the dune throughout the 7-mile stretch of wilderness. Attempted digging around exclosures was observed by FIIS staff at 4 nests (1A, 2B, 3A, and 9A). All of these nests were in the OPWA. No nests were predated this year, but tracks were observed near most nests. In addition, the presence of predators may be accountable for the occurrences of assumed predation of chicks throughout Fire Island, most notably in the OPWA. However, other disturbance factors such as weather events are also affecting the productivity of T&E species and it's difficult to determine one cause for failure. For example, two plover chicks were found dead in overwash areas with no sign of trauma: one from 1A on June 12<sup>th</sup> and another from 7A on June 29<sup>th</sup>. Both carcasses were sent out by VA Tech for a necropsy to determine the cause of death.

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 be covered by sand or washed away. This is usually a cause of nest failure. Two nests were overwashed in 2013 during the same storm on June 10<sup>th</sup> – 4A (Sailors Haven) and 2A (OPWA). Fire Island also had high levels of precipitation, particularly in the first half of the summer. This could have contributed to abandonment and/or chick mortality.

Significant browsing of seabeach amaranth individuals has been observed in past seasons, and again in 2013. Browsing impacts have been brought to the attention of the planning team for the White-tailed Deer Management Plan, so impacts to listed species are being included in the impacts chapter. Efforts next season should focus on protecting all amaranth individuals with small exclosures, when/if feasible.

### **8. RECOMMENDATIONS**

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

- During the 2013 field season, vehicle dune crossing routes and areas had to be closed due to the close proximity and home range 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. It will be beneficial to continue the effort to give prior warning to vehicle route closures so there is less confusion and fewer complications. 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. The intent was to have the graduate student (or other students) also lead a camera trap study and statistically summarize the park's monitoring data to assess whether red fox pose a significant threat to threatened and endangered species. The diet analysis was the only part of the idea to be completed, and currently the park is awaiting a report from the PI with results and interpretation.

- Observational data has shown white-tailed deer to be a possible threat to the survival and reproduction of seabeach amaranth. Several plants in 2008, and 2010-2013 showed signs of herbivory. This year the FIIS Wildlife Biologist began exclosing amaranth individuals when they were located as an additional protective measure. However, not all plants were found before they were extensively browsed and so every plant was not exclosed. Funding for an amaranth study has been awarded to the park through the PMIS Block Grant program for FY14. The exclosure design was tested this year, and the hope is that all amaranth individuals would be exclosed in the future, when/if feasible. In addition, the herbivory of amaranth has been brought to the attention of the park's White-tailed Deer Management planning team and is being considered in the plan/EIS.
- Annual reports have been written for T&E species in the past several years. However, trend data for each species needs to be evaluated. The FIIS Wildlife Biologist needs to collect, summarize and evaluate population data for all T&E species and species of special concern in a separate report. In addition, she will try and identify future management efforts to improve the success of T&E species on Fire Island.

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 |
| <i>Cicindela dorsalis dorsalis</i> | <b>Northeastern beach tiger beetle</b> | Not present     | N                             | Global rank: G4<br>Federal: threatened<br>NY State: extirpated |

**Table 1: List of federal and state-listed threatened and endangered species at Fire Island National Seashore. Marine animals (sea turtles, marine mammals, fish) and other rare/protected plants are not included in this list.**

| <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> | <u>Chicks Fledged per Pair</u> |
|----------------|-----------------------|----------------------|-------------------------|---------------------|-------------------------------------|-----------------------|----------------------------------------|--------------------------------|
| 1993           | 7                     | 7                    | 0                       | 0                   | 0                                   | 0                     | 0                                      | 0                              |
| 1994           | 3                     | 4                    | 0                       | 0                   | 0                                   | 0                     | 0                                      | 0                              |
| 1995           | 9                     | 2                    | 1                       | N/A <sup>1</sup>    | N/A                                 | 2                     | 1                                      | 0.2                            |
| 1996           | 2                     | 1                    | 1                       | N/A                 | N/A                                 | 1                     | 1                                      | 0.5                            |
| 1997           | 1                     | 1                    | 0                       | 0                   | 0                                   | 0                     | 0                                      | 0                              |
| 1998           | 1                     | 1                    | 1                       | N/A                 | N/A                                 | 1                     | 1                                      | 1                              |
| 1999           | 3                     | 2                    | 2                       | N/A                 | N/A                                 | 5                     | 2.5                                    | 1.7                            |
| 2000           | 3                     | 3                    | 3                       | N/A                 | N/A                                 | 9                     | 3                                      | 3                              |
| 2001           | 4                     | 4                    | 4                       | N/A                 | N/A                                 | 11                    | 2.8                                    | 2.8                            |
| 2002           | 10                    | 11                   | 9                       | 33                  | 3.3                                 | 28                    | 2.6                                    | 2.8                            |
| 2003           | 20                    | 22                   | 15                      | 64                  | 3.2                                 | 35                    | 1.6                                    | 1.8                            |
| 2004           | 17                    | 18                   | 15                      | 57                  | 3.4                                 | 37                    | 2.1                                    | 2.2                            |
| 2005           | 17                    | 20                   | 14                      | 54                  | 3.2                                 | 40                    | 2                                      | 2.4                            |
| 2006           | 21                    | 26                   | 15                      | 46                  | 2.2                                 | 32                    | 1.2                                    | 1.5                            |
| 2007           | 25                    | 35                   | 11                      | 45                  | 1.8                                 | 18                    | 0.5                                    | 0.7                            |
| 2008           | 15                    | 26                   | 8                       | 32                  | 2.1                                 | 20                    | 0.8                                    | 1.3                            |
| 2009           | 19                    | 24                   | 9                       | 53                  | 2.8                                 | 13                    | 0.5                                    | 0.7                            |
| 2010           | 16                    | 23                   | 9                       | 38                  | 2.2                                 | 17                    | 0.7                                    | 1.1                            |
| 2011           | 14                    | 16                   | 10                      | 38                  | 2.7                                 | 21                    | 1.3                                    | 1.9                            |
| 2012           | 12                    | 17                   | 8                       | 35                  | 2.9                                 | 15                    | 0.9                                    | 1.3                            |
| <b>2013</b>    | <b>11</b>             | <b>13</b>            | <b>3</b>                | <b>35</b>           | <b>3.2</b>                          | <b>7</b>              | <b>0.5</b>                             | <b>0.6</b>                     |
| <b>Average</b> | 10.952381             | 13.1                 | 6.6                     | 35.3                | 2.1                                 | 14.9                  | 1.3                                    | 1.3                            |

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

<sup>1</sup>Data from previous nesting seasons are incomplete

| Nest                                                                                                    | Area                                | Exclosed? | # of eggs laid | # of eggs hatched | # of chicks fledged | Result         |
|---------------------------------------------------------------------------------------------------------|-------------------------------------|-----------|----------------|-------------------|---------------------|----------------|
| 1A                                                                                                      | Wilderness EAST (section 9)         | Yes       | 4              | 4                 | 0                   | Hatched/Failed |
| 2A                                                                                                      | Wilderness EAST (section 8)         | Yes       | 4              | 0                 | 0                   | Overwashed     |
| 2B                                                                                                      | Wilderness EAST (section 9)         | Yes       | 4              | 0                 | 0                   | Abandoned      |
| 3A                                                                                                      | Wilderness WEST (section 2)         | Yes       | 4              | 4                 | 2                   | FLEDGED        |
| 4A                                                                                                      | Sailors Haven                       | Yes       | 4              | 0                 | 0                   | Overwashed     |
| 5A                                                                                                      | Lighthouse                          | Yes       | 4              | 3                 | 0                   | Hatched/Failed |
| 6A                                                                                                      | Wilderness WEST (section 5)         | Yes       | 4              | 4                 | 0                   | Hatched/Failed |
| 7A                                                                                                      | Wilderness EAST (section 8)         | Yes       | 5              | 4                 | 0                   | Hatched/Failed |
| 8A                                                                                                      | Wilderness WEST (section 5)         | Yes       | 4              | 4                 | 1                   | FLEDGED        |
| 9A                                                                                                      | Wilderness WEST (section 3)         | Yes       | 4              | 4                 | 0                   | Hatched/Failed |
| 10A                                                                                                     | Wilderness (section 7; flood shoal) | No        | 3              | 0                 | 0                   | Failed         |
| 10B                                                                                                     | Wilderness WEST (section 7)         | No        | 4              | 3                 | 0                   | Hatched/Failed |
| 11A                                                                                                     | Wilderness EAST (section 8)         | Yes       | 4              | 4                 | 4                   | FLEDGED        |
| <b>Totals</b>                                                                                           |                                     |           | <b>52</b>      | <b>34</b>         | <b>7</b>            |                |
| <b>Productivity (chicks fledged per pair)= 0.64</b>                                                     |                                     |           |                |                   |                     |                |
| *Otis Pike Wilderness Area. Nest designated West/East depending on its location from the Old Inlet area |                                     |           |                |                   |                     |                |

**Table 3: FIIS 2013 Overall Piping Plover productivity**

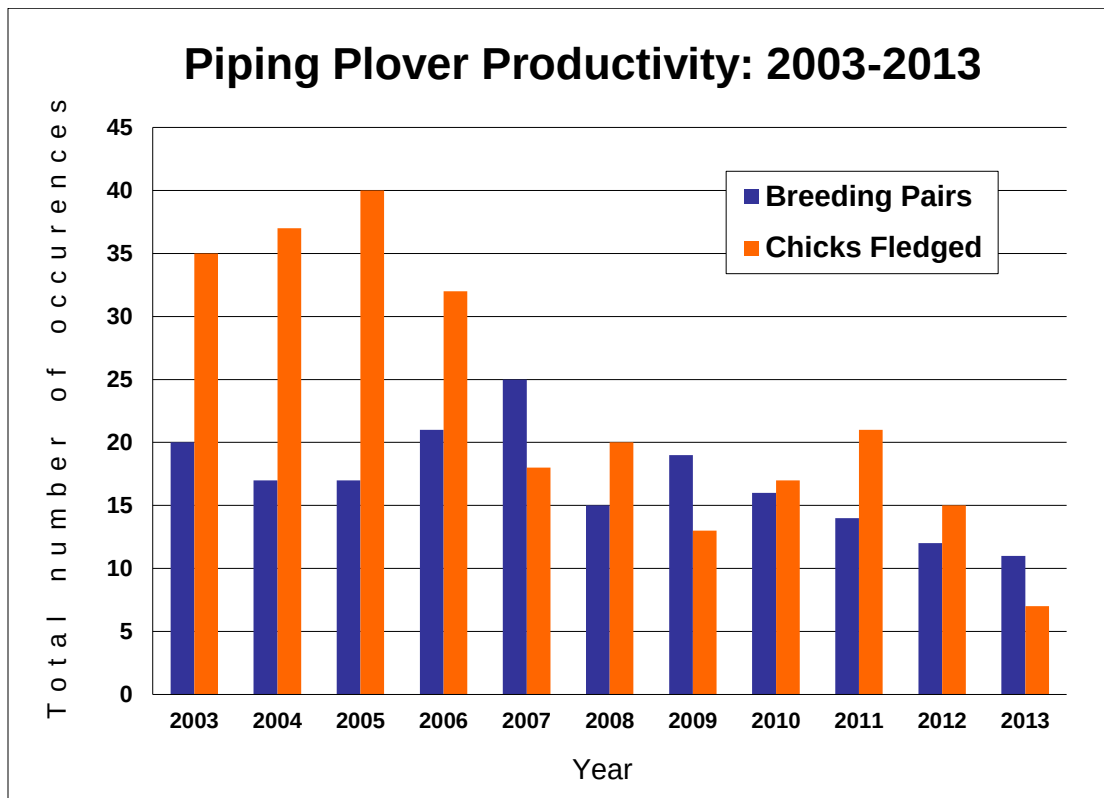


**Figure 1: The number of Piping Plover breeding pairs and the number of chicks fledged at FIIS, 2003-2013**

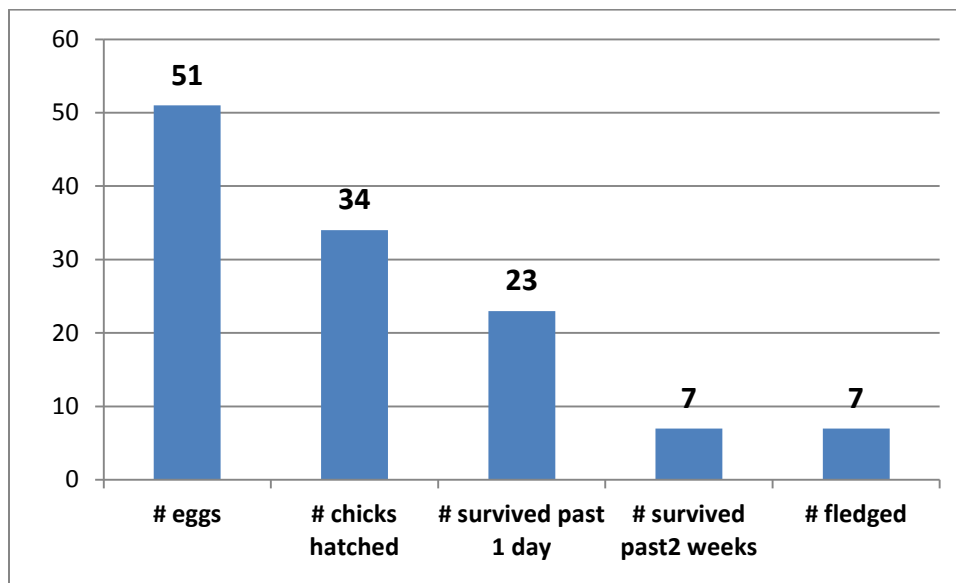


Figure 2: Bar graph of brood outcome for 2013 Piping Plovers at FIIS

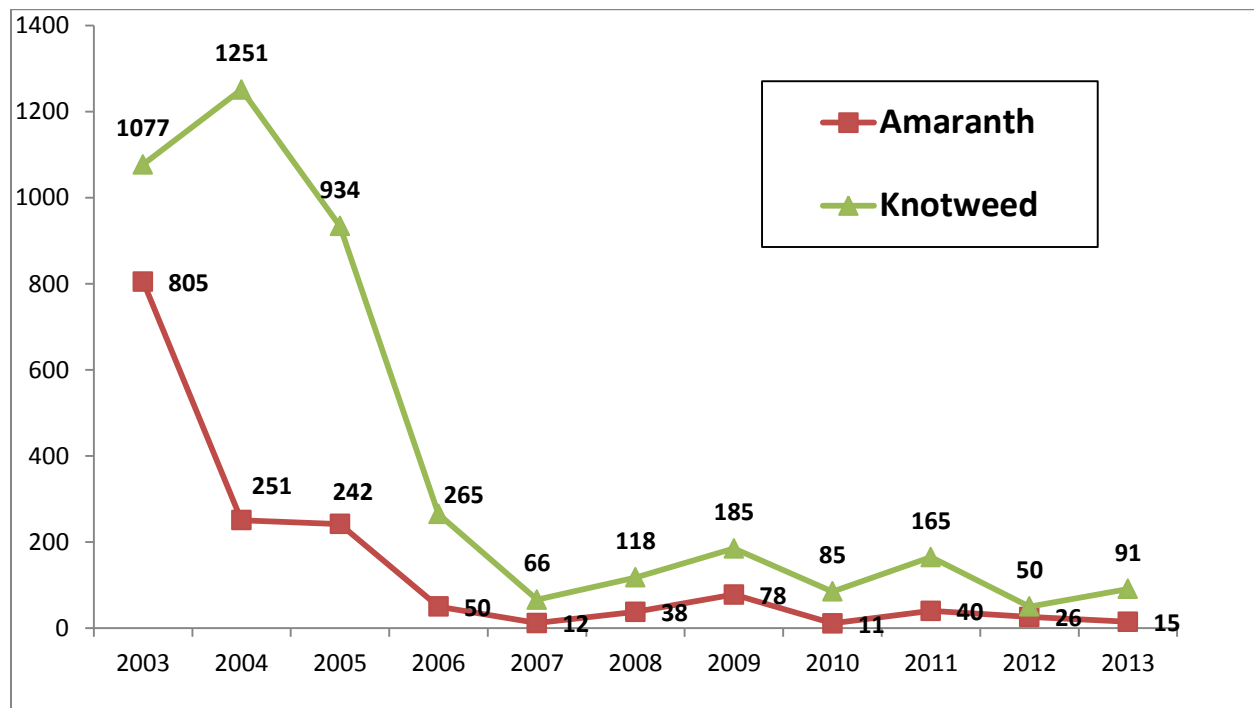


Figure 3: Chart displaying historical values for Seabeach Amaranth & Seabeach Knotweed on FIIS (2003-2013). The y-axis is the total number of plants counted that year.

| Survey Window                                                                                                     | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | 1st  | 2nd | Additional Observations:                             |
|-------------------------------------------------------------------------------------------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------------------------------------------------------|
| Site / Species                                                                                                    | COTE |     | LETE |     | AMOY |     | WILL |     | OSPR |     | GREG |     | GLIB |     | DCCO |     | GBBG |     | HEGU                                                 |
| Islip Spoil Island                                                                                                |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     | 1st: not surveyed; 2nd: not surveyed                 |
| Sexton Island                                                                                                     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     | 1st: not surveyed; 2nd: not surveyed                 |
| East Fire Island                                                                                                  |      | 232 |      | 16  |      | 2   |      | 9   |      |     |      |     |      |     |      |     |      |     | 1st: not surveyed                                    |
| Long Cove                                                                                                         | 400  | 420 |      |     | 1    |     | 1    | 5   |      |     |      |     |      |     |      |     |      |     | 1st: 1 MUSW                                          |
| Ridge Island                                                                                                      | 350  | 490 |      |     | 1    |     | 1    |     |      |     |      |     |      |     | 35   | 35  | 115  | 25  | 70 25                                                |
| Pelican Island                                                                                                    |      |     |      |     |      |     |      |     | 2    | 2   |      |     |      |     |      |     |      |     | 2nd: 22 GULL                                         |
| John Boyle Island                                                                                                 |      |     |      |     | 5    | 4   |      |     |      |     | 12   | 11  | 25   | 3   |      |     | 75   | 175 | 75 75                                                |
| Hospital Island                                                                                                   |      |     |      |     |      | 2   |      | 1   |      |     |      |     |      |     |      |     |      |     | 1st: 5 BCNH, 13 SNEG, 2 LIBH;<br>2nd: 1 BCNH, 6 LIBH |
| Watch Hill Bay                                                                                                    |      |     |      |     |      |     | 3    | 2   |      |     |      |     |      |     |      |     |      |     | 1st: inactive                                        |
| <b>Inactive Sites:</b> West Fire Island, Sailors Haven, Fire Island Villages, OPWA, Lighthouse, Fire Island Pines |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |                                                      |

**Table 4: Long Island Colonial Waterbird Surveys for Terns and Black Skimmers the 2013 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, MUSW = Mute Swan, GULL = unknown gull (either GBBG or HEGU), CAGO = Canadian Goose (\* = Davis Park included in Wilderness survey)

| Survey Window                                                                                              | Gull/ Wading Bird |      |      |      |      |      |      |      |      |      | Additional Observations: |
|------------------------------------------------------------------------------------------------------------|-------------------|------|------|------|------|------|------|------|------|------|--------------------------|
| Site / Species                                                                                             | COTE              | LETE | AMOY | WILL | OSPR | GREG | GLIB | DCCO | GBBG | HEGU |                          |
| Islip Spoil Island                                                                                         |                   |      | 2    |      |      | 18   | 7    |      | 100  | 220  |                          |
| Sexton Island                                                                                              |                   |      |      |      |      |      |      |      |      |      |                          |
| East Fire Island                                                                                           | 308               |      | 4    | 8    |      |      |      |      |      |      |                          |
| Long Cove                                                                                                  |                   |      |      |      |      |      |      |      |      |      |                          |
| Ridge Island                                                                                               |                   |      |      |      |      |      |      |      |      |      |                          |
| Pelican Island                                                                                             |                   |      |      |      | 2    |      |      |      |      |      |                          |
| John Boyle Island                                                                                          |                   |      |      |      |      |      |      |      |      |      |                          |
| Hospital Island                                                                                            |                   |      |      |      |      |      |      |      |      |      |                          |
| Watch Hill Bay                                                                                             |                   |      |      |      |      |      |      |      |      |      |                          |
| Inactive Sites: West Fire Island, Sailors Haven, Fire Island Villages, OPWA, Lighthouse, Fire Island Pines |                   |      |      |      |      |      |      |      |      |      |                          |

**Table 5: Long Island Colonial Waterbird Surveys for Gull and Wading Birds for the 2013 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, MUSW = Mute Swan, GULL = unknown gull (either GBBG or HEGU), CAGO = Canadian Goose (\* = Davis Park included in Wilderness survey)

| VA TECH Nest ID | NPS Nest ID | Subsite                                   | Fate      | Male banded | Female banded | Chick 1    | Chick 2    | Chick 3    | Chick 4    | # Fledged |
|-----------------|-------------|-------------------------------------------|-----------|-------------|---------------|------------|------------|------------|------------|-----------|
| PIPL01          | 2A-14       | East side of Old Inlet                    | Flooded   | GF(17)/Y    | GF(29)/O      | -          | -          | -          | -          | NA        |
| PIPL02          | 1A-14       | East side of Old Inlet                    | Hatched   | GF(06)/Y    | GF(08)/O      | A/C/A/C    | A/G/Y/Y    | A/Y/A/W    | Y/G/Y/W    | 0         |
| PIPL05          | 6A-14       | Watch Hill                                | Hatched   | GF(65)/O    | GF(24)/O      | not banded | not banded | not banded | not banded | 0         |
| PIPL06          | 3A-14       | Watch Hill                                | Hatched   | GF(64)/O    | GF(97)/O      | not banded | not banded | A/C/Y/C    | A/R/A/W    | 2         |
| PIPL13          | 7A-14       | East side of Old Inlet                    | Hatched   | GF(82)/O    | GF(28)/O      | Y/C/Y/R    | -          | -          | -          | 0         |
| PIPL14          | 9A-14       | Watch Hill                                | Hatched   | not banded  | not banded    | not banded | not banded | not banded | not banded | 0         |
| PIPL15          | 8A-14       | Old Inlet West Reference (Bellport Beach) | Hatched   | GF(88)/O    | not banded    | A/G/Y/G    | A/G/Y/W    | A/K/A/R    | A/R/Y/Y    | 0         |
| PIPL16          | 10A-14      | Flood Shoal                               | Failed    | not banded  | not banded    | -          | -          | -          | -          | NA        |
| PIPL19          | 11A-14      | East side of Old Inlet                    | Hatched   | GF(90)/O    | Y/C/Y/C       | A/G/A/R    | Y/W/A/C    | not banded | not banded | 4         |
| PIPL20          | 2B-14       | East side of Old Inlet                    | Abandoned | ?           | GF(17)/Y      | -          | -          | -          | -          | NA        |
| PIPL24          | 10B-14      | Old Inlet West Reference (Bellport Beach) | Hatched   | Y/G/A/R     | not banded    | -          | Y/C/A/G    | A/Y/Y/C    | A/W/A/R    | 0         |

**Table 6: Piping Plover Banding Information from Virginia Tech Study.** Researchers collected carcasses of A/G/Y/Y and Y/C/Y/R for necropsy. GF = Green Flag, Y = Yellow, O = Orange. Please refer to Annual Report 2013 for more information (reference is in Works Cited section).

## Appendix B: Maps



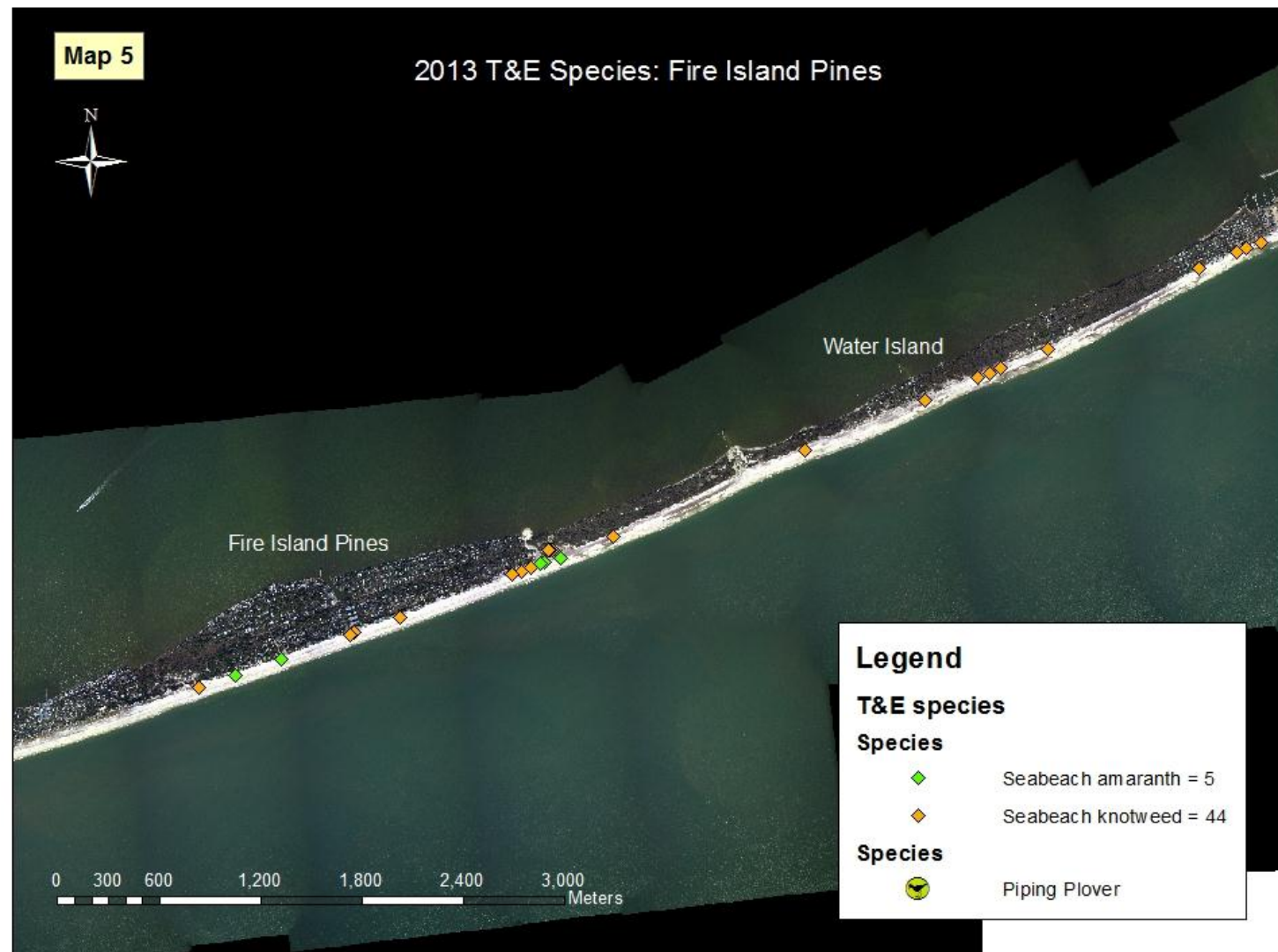
**Map 1: Map of Fire Island National Seashore**

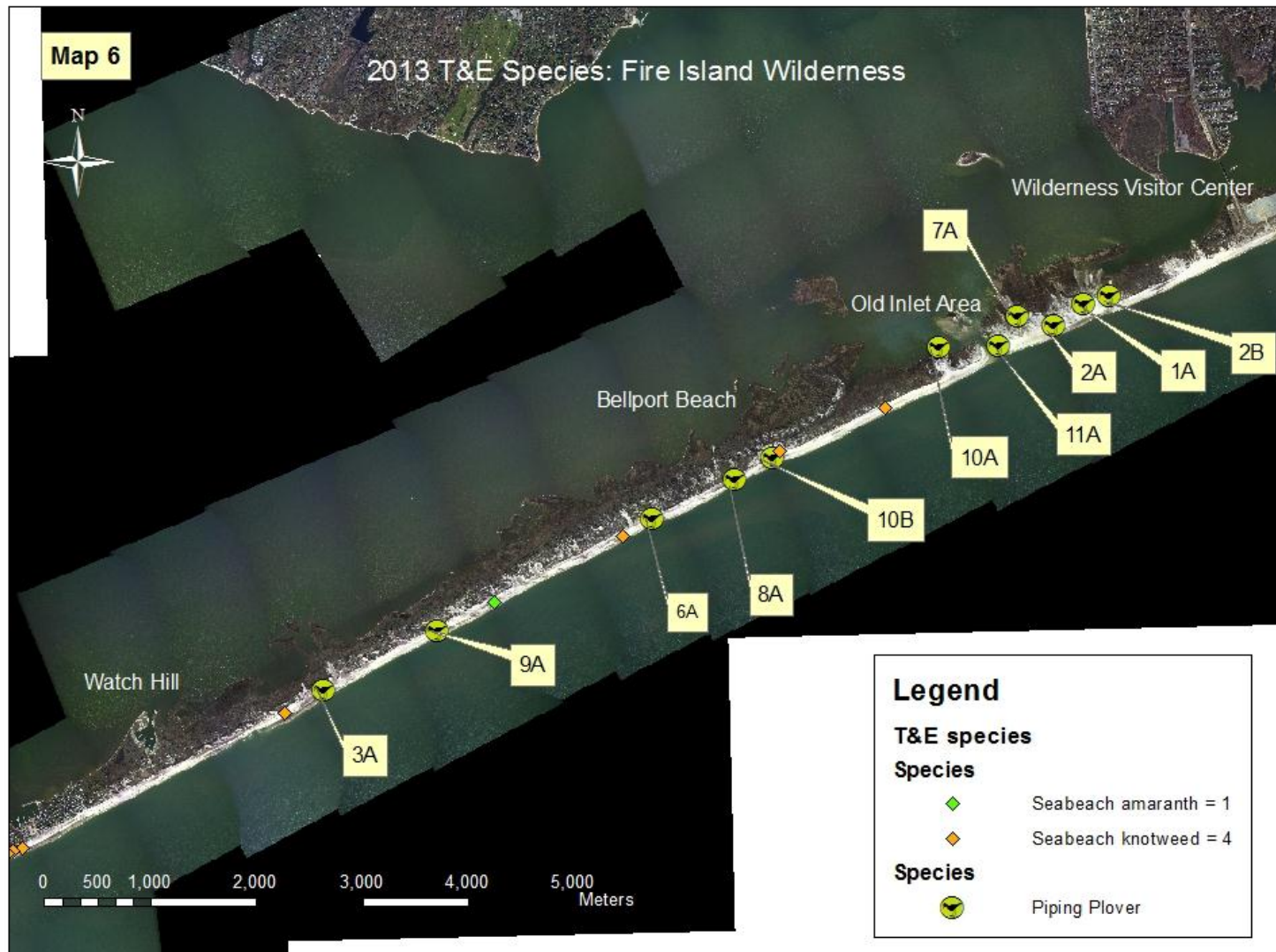
**Maps 2 - 6: Locations of threatened and endangered species in 2013.** Maps are organized by Long Island Colonial Waterbird Survey areas and include piping plover nests, seabeach amaranth and seabeach knotweed individuals.











## Appendix C: GPS locations

### 1. Piping Plover Nests

| Nest   | Species       | Site Name (LICWS)         | Location Description    | UTM (x) | UTM (y) | Exclosed? | Productivity |
|--------|---------------|---------------------------|-------------------------|---------|---------|-----------|--------------|
| 1A-13  | Piping Plover | Fire Island Wilderness    | OPWA-East               | 678670  | 4510671 | yes       | 0            |
| 2A-13  | Piping Plover | Fire Island Wilderness    | OPWA-East               | 678383  | 4510465 | no        | 0            |
| 2B-13  | Piping Plover | Fire Island Wilderness    | OPWA-East               | 678915  | 4510745 | no        | 0            |
| 3A-13  | Piping Plover | Fire Island Wilderness    | OPWA-West               | 671499  | 4507023 | yes       | 2            |
| 4A-13  | Piping Plover | Fire Island Sunken Forest | Sailors Haven-West      | 659430  | 4501961 | yes       | 0            |
| 5A-13  | Piping Plover | Fire Island Lighthouse    | Lighthouse-East         | 651378  | 4499437 | yes       | 2            |
| 6A-13  | Piping Plover | Fire Island Wilderness    | OPWA-West               | 674595  | 4508641 | yes       | 4            |
| 7A-13  | Piping Plover | Fire Island Wilderness    | OPWA-East               | 678049  | 4510563 | yes       | 3            |
| 8A-13  | Piping Plover | Fire Island Wilderness    | OPWA-West               | 675377  | 4509006 | yes       | 4            |
| 9A-13  | Piping Plover | Fire Island Wilderness    | OPWA-West               | 672567  | 4507584 | yes       | 0            |
| 10A-13 | Piping Plover | Fire Island Wilderness    | OPWA-West – flood shoal | 677307  | 4510260 | no        | 0            |
| 10B-13 | Piping Plover | Fire Island Wilderness    | OPWA-West               | 675731  | 4509216 | no        | 0            |
| 11A-13 | Piping Plover | Fire Island Wilderness    | OPWA-East               | 677870  | 4510281 | yes       | 4            |

## 2. Seabeach amaranth individuals

| Site Name (LICWS)      | Location Description | Date found | UTMs (x) | UTMs (y) | # of plants | max size (cm) | Evidence of Browsing (date(s)/none)                | Reproductive (date(s)/none)                | Dead/Gone date | Additional Notes:                | Exclosed? (Y/N) |
|------------------------|----------------------|------------|----------|----------|-------------|---------------|----------------------------------------------------|--------------------------------------------|----------------|----------------------------------|-----------------|
| Fire Island Pines      | Talisman             | 8/5/2013   | 664499   | 4503664  | 1           | 16            | 8/5-None                                           | 8/20-Flowering                             |                |                                  | Y - 8/06        |
| Fire Island Pines      | Talisman             | 8/5/2013   | 664404   | 4503636  | 1           | 12            | 8/5-None, 8/20-Heavy browsing                      | 8/5-Flowering                              |                | All leaves eaten by 8/20, 8.0 cm | N               |
| Fire Island Pines      | Talisman             | 8/5/2013   | 664378   | 4503629  | 1           | 4.5           | 8/5-None                                           |                                            |                |                                  | N               |
| Fire Island Pines      | Fire Island Pines    | 7/16/2013  | 662577   | 4502969  | 1           | 25.5          | Before 8/15 - browsed. Now recovering              | 9/10-Flowering                             |                |                                  | Y - 8/15        |
| Fire Island Villages   | Saltaire             | 7/18/2013  | 652720   | 4499879  | 1           | 7.5           | 7/31-Gone, 100% browsed                            |                                            | 7/31 - Gone    | Likely browsed, adj. veg intact  | N               |
| Fire Island Pines      | Fire Island Pines    | 7/16/2013  | 662845   | 4503066  | 1           | 10            | Before 8/15 - browsed. Now recovering              | 9/10-Flowering                             |                |                                  | Y - 8/15        |
| Fire Island Villages   | Ocean Beach          | 7/18/2013  | 655580   | 4500798  | 1           | 25.5          | 8/12-75% browsed                                   |                                            |                | 8/12-covered with sand           | N               |
| Fire Island Villages   | Ocean Bay Park       | 7/18/2013  | 657527   | 4501363  | 1           | 20.5          | 8/5 and 9/10-95% browsed                           |                                            |                |                                  | N               |
| Fire Island Villages   | Point O' Woods       | 8/5/2013   | 658036   | 4501534  | 1           | 60            | 8/5 and 8/20 - None; 9/10 - 99% browsed            |                                            |                |                                  | N               |
| Fire Island Villages   | Point O' Woods       | 8/5/2013   | 657955   | 4501508  | 1           | 37            | 8/5-50% browsed, 8/20-50% browsed, 9/10-recovering | 9/10-Flowering                             |                |                                  | Y - 8/20        |
| Fire Island Villages   | Point O' Woods       | 8/5/2013   | 658062   | 4501538  | 1           | 25.5          | 8/5-95% browsed                                    | 9/10-Flowering                             |                |                                  | Y - 8/20        |
| Fire Island Villages   | Point O' Woods       | 8/5/2013   | 658010   | 4501537  | 1           | 7.5           | 8/5 and 8/20-None                                  | 9/10-Flowering                             |                |                                  | Y - 8/20        |
| Fire Island Villages   | Point O' Woods       | 8/5/2013   | 658526   | 4501698  | 1           | 25.5          | 8/5 and 8/20-None                                  |                                            |                |                                  | Y - 8/20        |
| Fire Island Villages   | Point O' Woods       | 19-Aug     | 658531   | 4501698  | 1           | 15            | 8/19 and 8/20-None                                 | 9/10-Flowering                             |                |                                  | N               |
| Fire Island Wilderness | OPWA-West            | 8/20/2013  | 673099   | 4507855  | 1           | 39            | 8/20-None                                          | 8/20-Flowering and Fruiting, 9/27-Fruiting |                |                                  | Y - 8/20        |

### 3. Seabeach knotweed individuals

| Site Name (LICWS)         | Location Description | Date      | UTMs (x) | UTMs (y) | # of plants |
|---------------------------|----------------------|-----------|----------|----------|-------------|
| Fire Island Wilderness    | OPWA-West            | 8/1/2013  | 675791   | 4509277  | 1           |
| Fire Island Pines         | Davis Park           | 8/6/2013  | 668645   | 4505532  | 1           |
| Fire Island Pines         | Blue Point Beach     | 8/5/2013  | 667379   | 4504901  | 1           |
| Fire Island Pines         | Blue Point Beach     | 8/5/2013  | 667100   | 4504792  | 1           |
| Fire Island Pines         | Blue Point Beach     | 8/5/2013  | 667038   | 4504756  | 1           |
| Fire Island Pines         | Blue Point Beach     | 8/5/2013  | 666969   | 4504734  | 1           |
| Fire Island Pines         | Water Island         | 8/5/2013  | 666656   | 4504595  | 1           |
| Fire Island Pines         | Talisman             | 8/5/2013  | 665949   | 4504302  | 1           |
| Fire Island Pines         | Talisman             | 8/5/2013  | 664815   | 4503788  | 1           |
| Fire Island Pines         | Talisman             | 8/5/2013  | 664455   | 4503713  | 1           |
| Fire Island Pines         | Talisman             | 8/5/2013  | 664434   | 4503709  | 1           |
| Fire Island Pines         | Talisman             | 8/5/2013  | 664430   | 4503710  | 15          |
| Fire Island Pines         | Talisman             | 8/5/2013  | 664405   | 4503637  | 1           |
| Fire Island Pines         | Carrington Tract     | 8/6/2013  | 662360   | 4502895  | 1           |
| Fire Island Sunken Forest | Sailors Haven        | 8/5/2013  | 660420   | 4502282  | 1           |
| Fire Island Villages      | Kismet               | 8/7/2013  | 652155   | 4499685  | 1           |
| Fire Island Lighthouse    | Lighthouse Beach     | 8/7/2013  | 651716   | 4499561  | 1           |
| Fire Island Lighthouse    | Lighthouse Beach     | 8/7/2013  | 651710   | 4499575  | 1           |
| Fire Island Lighthouse    | Lighthouse Beach     | 8/7/2013  | 651629   | 4499544  | 1           |
| Fire Island Lighthouse    | Lighthouse Beach     | 8/7/2013  | 651599   | 4499532  | 1           |
| Fire Island Lighthouse    | Lighthouse Beach     | 8/7/2013  | 651596   | 4499533  | 3           |
| Fire Island Villages      | Kismet               | 8/22/2013 | 652092   | 4499664  | 1           |
| Fire Island Lighthouse    | Lighthouse Beach     | 8/22/2013 | 650903   | 4499319  | 1           |
| Fire Island Sunken Forest | Sailors Haven        | 8/27/2013 | 660667   | 4502365  | 1           |
| Fire Island Sunken Forest | Sailors Haven        | 8/27/2013 | 659375   | 4501964  | 1           |
| Fire Island Wilderness    | OPWA-West            | 8/20/2013 | 671119   | 4506802  | 1           |
| Fire Island Wilderness    | OPWA-West            | 8/20/2013 | 674311   | 4508475  | 1           |
| Fire Island Wilderness    | OPWA-West            | 8/20/2013 | 676791   | 4509693  | 1           |

|                      |                   |           |        |         |   |
|----------------------|-------------------|-----------|--------|---------|---|
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658045 | 4501537 | 2 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 657989 | 4501538 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658209 | 4501604 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658037 | 4501556 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658022 | 4501533 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658540 | 4501701 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658540 | 4501725 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658041 | 4501546 | 2 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 657696 | 4501403 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 657731 | 4501416 | 1 |
| Fire Island Villages | Point O' Woods    | 8/5/2013  | 658059 | 4501546 | 1 |
| Fire Island Pines    | Davis Park        | 8/12/2013 | 668277 | 4505375 | 1 |
| Fire Island Pines    | Fire Island Pines | 8/12/2012 | 664329 | 4503608 | 1 |
| Fire Island Pines    | Fire Island Pines | 8/12/2013 | 664270 | 4503579 | 6 |
| Fire Island Pines    | Fire Island Pines | 8/12/2013 | 664214 | 4503564 | 1 |
| Fire Island Pines    | Fire Island Pines | 8/12/2013 | 663548 | 4503310 | 4 |
| Fire Island Villages | Ocean Beach       | 8/12/2013 | 655733 | 4500826 | 2 |
| Fire Island Villages | Corneille Estates | 8/12/2013 | 655576 | 4500800 | 1 |
| Fire Island Pines    | Davis Park        | 7/16/2013 | 668554 | 4505497 | 1 |
| Fire Island Pines    | Davis Park        | 8/12/2013 | 668503 | 4505474 | 1 |
| Fire Island Villages | Dunewood          | 7/16/2013 | 654002 | 4500291 | 1 |
| Fire Island Villages | Ocean Bay Park    | 7/16/2013 | 657209 | 4501249 | 1 |
| Fire Island Villages | Fair Harbor       | 7/16/2013 | 653884 | 4500261 | 2 |
| Fire Island Villages | Ocean Bay Park    | 7/16/2013 | 657215 | 4501253 | 1 |
| Fire Island Villages | Fair Harbor       | 7/16/2013 | 653843 | 4500237 | 1 |
| Fire Island Villages | Ocean Bay Park    | 7/16/2013 | 657258 | 4501268 | 1 |
| Fire Island Villages | Fair Harbor       | 7/16/2013 | 653807 | 4500236 | 1 |
| Fire Island Villages | Fair Harbor       | 7/16/2013 | 653765 | 4500218 | 1 |
| Fire Island Villages | Ocean Bay Park    | 7/16/2013 | 657265 | 4501267 | 1 |
| Fire Island Villages | Fair Harbor       | 7/16/2013 | 653563 | 4500153 | 1 |

|                      |                   |           |        |         |   |
|----------------------|-------------------|-----------|--------|---------|---|
| Fire Island Villages | Ocean Bay Park    | 7/16/2013 | 657371 | 4501302 | 1 |
| Fire Island Villages | Ocean Bay Park    | 7/16/2013 | 657419 | 4501309 | 1 |
| Fire Island Pines    | Fire Island Pines | 8/15/2013 | 663280 | 4503221 | 1 |
| Fire Island Villages | Ocean Bay Park    | 9/10/2013 | 657518 | 4501360 | 1 |
| Fire Island Pines    | Fire Island Pines | 8/12/2013 | 663258 | 4503211 | 1 |