Appendix G

Environmental Monitoring Reports, 2004-2007

Western Fire Island and Fire Island Pines Beach Nourishment Project

2007 Environmental Monitoring Report

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Introduction

Following the Fall 2003/Winter 2004 beach nourishment projects at Fire Island, monitoring was conducted to assess the recovery of flora and fauna inhabiting the beaches. 2007 is the fourth year of monitoring; surveys were conducted for birds and wildlife, including the endangered Piping plover (*Charadrius melodus*) and Least tern (*Sterna antillarum*). Recovery of Seabeach amaranth (*Amaranthus pumilus*), another endangered species, was also recorded. This report summarizes the results of all surveys, for analysis by Fire Island National Seashore (National Parks Service).

Methodology

Piping Plover/Least Tern Fencing and Monitoring

Symbolic fencing was installed in areas designated at a site meeting in March 2007 between members of Fire Island National Seashore, U.S. Fish & Widlife Service, The Nature Conservancy and Land Use Ecological Services. Appendix A shows the location of symbolic fencing in the western Fire Island communities and Fire Island Pines.

Materials used to install fencing were: 66" carsonite flex rod posts (300), polypropelene/nylon twine (12 rolls), flags (12 rolls), "Do Not Enter" Signs (350). Posts were spaced thirty feet (30') apart, connected by polypropelene/nylon twine. Flags were placed every 8-10 feet apart, with 3-5 flags per section of twine. Signs were then placed on every third post, concentrated to every other post or every post around walkways and high traffic areas.

Monitoring for the entire project area was conducted three days per week at varying times and tides. The area was surveyed thoroughly using binoculars when necessary. On each visit, a Daily Site Visit Form was completed, including a GPS position and description of activity of any endangered Piping plovers or Least terns.

Seabeach Amaranth Surveys

Surveys were conducted for the presence of Seabeach amaranth, *Amaranthus pumilus*, once per month throughout the project area, weather permitting. The entire beach was surveyed and GPS position(s) of Seabeach amaranth plants were plotted on the ArcGIS map of the project area.

Results

Piping Plover/Least Tern Monitoring

Western Fire Island

Monitoring was conducted from April 3rd through June 29th. Surveys were performed three times per week during fair weather, in morning and afternoon hours at varying tides. There were neither Piping plovers nor Least terns observed during the monitoring period in this project area. However, other species observed within the fenced area and throughout the project site included Common terns, Herring gulls, Ring-billed gulls, Laughing gulls, Great black-backed gulls, American crow, rock doves, dogs (loose and leashed), and people. Table 1 summarizes the dates and times of each survey.

Table 1. Monitoring results for the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

Month	Date	Time	Observations
April	4/3	1245	• No birds • Heavy beach traffic- tracks in symbolic fence area
	4/6	1300	• 2 Laughing gulls • 2 Great black backed gulls • 8 Herring gulls • Tire tracks within symbolic fence area in Dunewood, repaired
	4/7	1145	• 4 Herring gulls • 4 Great black backed gulls • 2 Ring-billed gulls • Evidence of heavy beach traffic- tracks in symbolic fencing • Tide still high
	4/9	1500	• No birds observed
	4/10	1600	• 4 Ring-billed gulls • 5 Great black backed gulls • Repaired fencing
	4/13	1015	• No birds observed • Evidence of heavy beach traffic- tracks in symbolic fencing • Evidence of high tide into fenced area • Repaired fencing
	4/14	1200	• No birds observed
	4/18	0800	• Severe erosion along entire length (beach, dunes, etc.) • ALL symbolic fencing gone (much of snow fence gone) • Tides landward of dunes • Lots of debris on beach • No wildlife observed
	4/19	1630	• 1 Herring gull • 1 Ring-billed gull • 2 Great black backed gulls • Tides still high, lots of debris on beach
	4/24	1145	• 9 Herring or ring-billed gulls • 2 Mallards
	4/25	0900	• 2 Herring gulls • 2 Great black backed gulls
	4/26	1130	• 12 gulls (herring, great black backed, ring-billed)
May	5/2	1300	• 10 Herring gulls • 2 Ring-billed gulls • 4 Great black backed gulls • Symbolic fence reinstalled Saltaire, Fair Harbor
	5/3	1500	• 2 Ring-billed gulls • 3 Great black backed gulls
	5/4	1400	• 4 Laughing gulls • 3 Ring-billed gulls • 4 Great black backed gulls • 2 Herring gulls
	5/7	1200	• 7 Laughing gulls • 6 Ring-billed gulls • 4 Great black backed gulls • 1 Greater yellowlegs

Month	Date	Time	Observations
	5/10	1030	• 4 gulls flying and in surf zone • 2 Rock doves • Beach still severely eroded with heavy beach traffic
	5/11	1600	• 4 Herring gulls • 3 Laughing gulls • 12 Ring-billed gulls • 13 Great black backed gulls • 1 American crow
	5/15	1200	• 4 European starlings in surf zone • 1.5-3’ scarp along entire site • Heavy beach traffic evident
	5/17	1530	• No wildlife • Beach appeared even more eroded, heavy beach traffic
	5/21	1600	• 3 Great black backed gulls • 1 Ring-billed gull
	5/23	1200	• 4 Great black-backed gulls • 6 Ring-billed gulls • 2 European starlings
	5/24	1030	• 2 Common terns (flying)
	5/29	1045	• No shorebirds observed
May cont’d	5/31	1330	• 3 Ring-billed gulls • 6 Great black backed gulls • 1 American crow • 3 Common grackles • 1 Northern gannet
	6/1	1100	• 2 Ring-billed gulls • 1 Common tern • 2 Common grackles
	6/5	1630	• 2 Great black backed gulls • 2 Common terns • Tire tracks through most of fence, major fence repairs
	6/7	1400	• 15 Great black backed • 3 Ring-billed gulls • 5 Herring gulls (flying)
	6/12	1200	• 1 Herring gull • 2 Great black backed gulls
	6/14	0930	• 3 Great black backed gulls • 2 common grackles
June	6/18	1400	• 2 Herring gull • 2 Great black-backed gull • 2 Common grackles • Major fence repairs in Fair Harbor
	6/21	1100	• 1 Great black-backed gull • 1 Herring gull • 1 Laughing gull • 1 American crow
	6/26	1400	• 1 Herring gull
	6/27	0845	• 1 Great black backed gull
	6/29	0700	• 3 Great black backed gulls • 2 Ring-billed gulls

As there were no observations of piping plovers in the project area, symbolic fencing was removed on June 29th with the exception of areas containing seabeach amaranth plants.

Fire Island Pines

Monitoring for Fire Island Pines was conducted from April 3rd through June 29th during fair weather, both in morning and afternoon hours. Please refer to Table 2 for a summary of monitoring efforts and results in Fire Island Pines. There was a single Piping plover observed foraging on two occasions near the eastern border of Fire Island Pines. Other species observed during the monitoring period included American crow, Great black-backed gull, Herring gull, Ring-billed gull, Common tern, rock dove , dogs (loose and leashed), and people. The birds were resting, flying, or foraging, and no nesting or breeding activity was seen.

Table 2. Monitoring results for Fire Island Pines.

Month	Date	Time	Observations
April	4/3	1330	• 3 Laughing gulls
	4/6	1130	• 8 Herring gulls • 180-205 Sanderlings
	4/7	1145	• 50-70 Sanderlings in intertidal • 3 American crows • 3 Herring gulls • 1 Great black backed gull • 1 Ring-billed gull
	4/9	1400	• 1 Great black backed gull • 1 Herring gull • 175-200 Sanderlings
	4/10	1300	• 2 Herring gulls • 4 American crows
	4/13	1145	• No birds • 1 deer on dune • Tides running high, beach scarped
	4/14	1200	• No birds observed
	4/18	0900	• No wildlife observed • ALL symbolic fencing gone, much snow fence gone • Severe erosion of beach, dune, lots of debris on beach, tides landward of dune
	4/19	1530	• No wildlife observed • Beach still full of debris
	4/24	1000	• No wildlife observed
	4/25	1200	• 6 Mallards • 2 Great black backed gulls • 5 Ring-billed gulls • 1 Herring gull
May	5/2	1100	• 4 Mallards • 2 Ring-billed gulls • 4 Great black backed gulls

Month	Date	Time	Observations
	5/3	1300	• 11 great black backed gulls • 19 Ring-billed gulls • 8 Herring gulls • 6 Mallards • 5 Sanderlings
	5/4	1500	• 48 gulls (Great black backed, Ring-billed, Herring)
	5/7	1400	• 6 Ring-billed gulls • 2 Great black backed gulls • 2 Mallards • 2 Common grackles in symbolic fence area
	5/10	1130	• 1 Mallard • 6 gulls • Tides running high, close to dune
	5/11	1430	• 3 Laughing gulls • 3 Ring-billed gulls • 1 Northern gannet (injured, SCDPW was taking to wildlife rehabilitator)
	5/15	1345	• 4 gulls • 2 Mallards
	5/17	1100	• 4 American crows • 3 Herring gulls
	5/21	1500	• 4 Ring-billed gulls • Common grackles • 2 European starlings • Symbolic fencing reinstalled
	5/23	1445	• 2 American crows • 1 Rock dove • 2 Ring-billed gulls • Fence in good condition, bathers present
	5/24	1500	• 3 Ring-billed gulls • 6 Common grackles • 1 American crow • 2 Great black backed gulls
	5/29	1430	• 1 Common tern • 3 Great black backed gulls • 2 herring gulls
	5/31	1430	• 2 Ring-billed gulls
June	6/1	1230	• 2 Rock doves • 1 Common grackle
	6/5	1130	• No birds observed
	6/7	1515	• 2 Great black backed gulls • 2 Ring-billed gulls • 1 Piping plover just east of eastern boundary foraging at water line
	6/12	1330	• 2 American crows • 2 Great black backed gulls • 4 Common terns • 2 gulls flying over water
	6/13	1300	• No birds observed

Month	Date	Time	Observations
	6/14	1430	• 1 Piping plover foraging at water line between Fisherman's Walk and eastern FIP boundary • 1 Common grackle
	6/18	1530	• 1 Great black backed gull • 16 Common grackles foraging in wrackline
	6/21	1330	• 2 Great black backed gulls • 2 Herring gulls • 1 Ring-billed gull • 1 American crow • 1 Common grackle
	6/26	1530	• 1 Great black backed gull
	6/27	1000	• 2 American crows • 4 Common grackles
	6/29	0900	• Several common grackles

The Piping plover observed on June 7th and June 14th was no observed after June 14th. The plover was foraging alone, and no other individuals were observed in the project area. Symbolic fencing was removed on June 29th with the exception of areas containing seabeach amaranth plants.

Seabeach amaranth Surveys

Western Fire Island

Seabeach amaranth, *Amaranthus pumilus*, was recorded throughout the western Fire Island project area from June through October. Six (6) individuals were recorded throughout the observation period. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Most amaranth plants were found landward of existing snow fencing, and required no additional protection. However, one individual was found in the "V" of snow fence; twine and signage was placed to protect that plant. Figure 1 and Table 3 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 1. Seabeach amaranth observed locations in the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

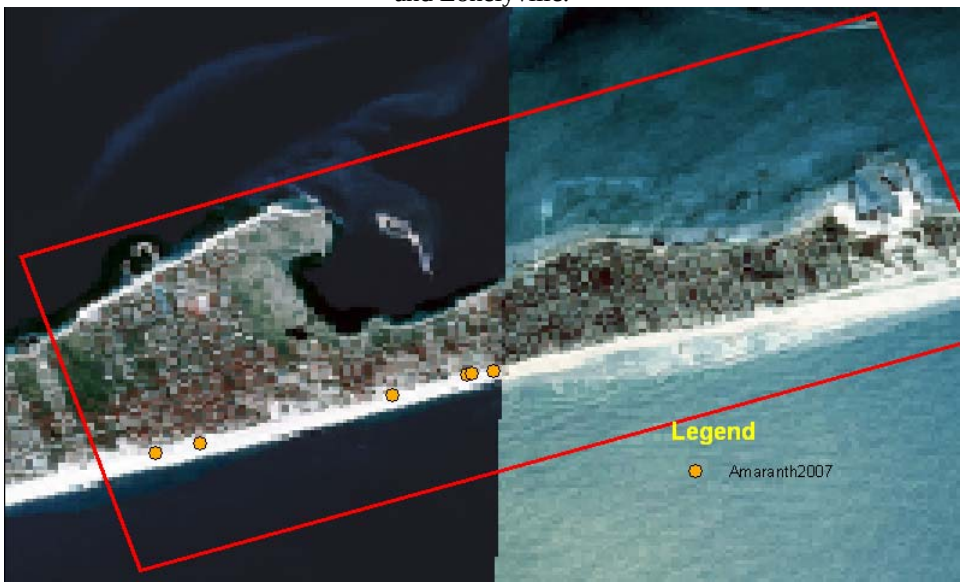

Table 3. Seabeach amaranth plants observed in Saltaire, Fair Harbor, Dunewood and Lonelyville.

Latitude	Longitude	Size	# Plants	Location (out from dune, etc.)
40º 38.062' N	73º 11.924' W	7"	1	Landward of snow fence
40º 38.087' N	73º 11.834' W	3"	1	Landward of snow fence
40º 38.175' N	73º 11.430' W	5"	1	Landward of snow fence
40º 38.217' N	73º 11.275' W	2.5"	1	Landward of snow fence
40º 38.220' N	73º 11.265' W	2.5"	1	Landward of snow fence
40º 38.209' N	73º 11.219' W	1.25"	1	Fair Harbor, in "V" of snow fence, added twine to protect plan

Fire Island Pines

Seabeach amaranth was recorded throughout Fire Island Pines from June through October. A total of two (2) plants were observed. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Both amaranth plants were found landward of existing snow fencing, and as such, symbolic fencing was not needed. Figure 2 and Table 4 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 2. Seabeach amaranth observed locations in Fire Island Pines.

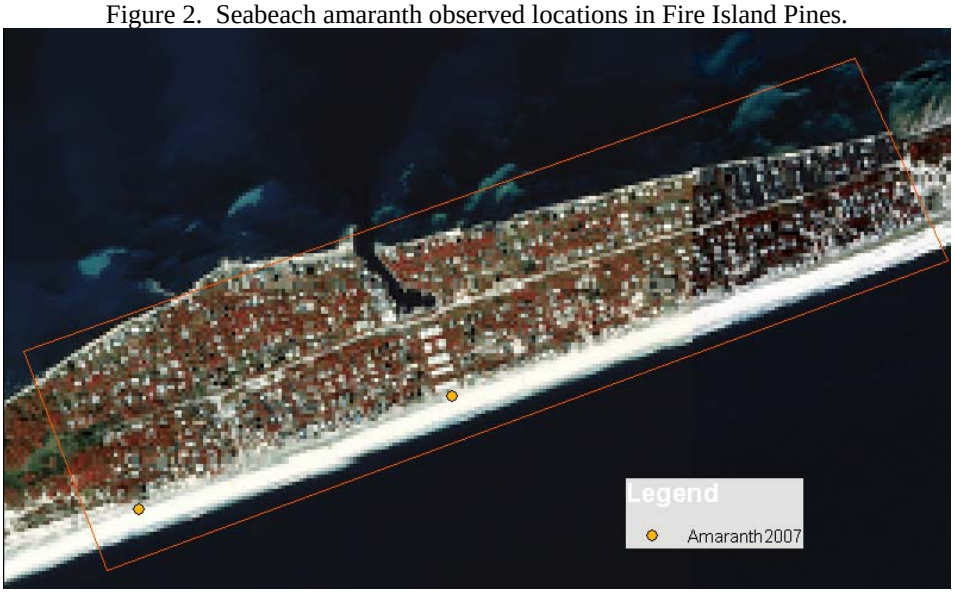

Table 4. Observations of Seabeach amaranth in Fire Island Pines.

Latitude	Longitude	Size	# Plants	Location
40º 39.821' N	73º 04.080' W	3"	1	In front of condos (Harbor-Atlantic Walks), in low area behind most seaward dune
40º 39.696' N	73º 04.571' W	5"	1	3' west of Susan Walk, at top of dune

Discussion and Conclusions

Vegetative assemblages and cover appear to be reverting to pre-construction conditions. Although western Fire Island communities of Saltaire, Fair Harbor, Dunewood, and Lonelyville maintained the number of Seabeach amaranth plants colonizing the beaches, Fire Island Pines saw a significant drop-off in the abundance of seabeach amaranth this year. This is presumably due to the nor'easter of April 18th that caused severe erosion of the entire project area. The nor'easter caused erosion of beach and dune habitats, and areas known for abundant vegetation, such as central Fire Island Pines, exhibited almost no beach vegetation this year.

Shorebirds continue to inhabit the project area. Several gull species have been observed throughout the monitoring period, and continue to thrive. Piping plovers continue to be a rare occurrence in the project area. Although there was one Piping plover observed, the individual was solitary and foraging at the shoreline. There were no observations of pairs, nor was there any evidence of plover nesting. This is consistent with observations over the last three years, as none of the communities are known to be Piping plover nesting sites.

Appendix A—Symbolic Fence Plan

The following pages depict the location of symbolic fencing along the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville, and along Fire Island Pines.

Western Fire Island and Fire Island Pines Beach Nourishment Project

2006 Environmental Monitoring Report

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Date of Completion: December 5, 2006

Introduction

Following the Fall 2003/Winter 2004 beach nourishment projects at Fire Island, monitoring was conducted to assess the recovery of flora and fauna inhabiting the beaches. Following the 2005 monitoring season and data analysis, it was determined that invertebrate and vegetation (excluding Seabeach amaranth) communities had returned to a pre-construction condition or better. As such, vegetation transects and invertebrate surveys were not conducted in 2006.

Surveys were conducted for birds and wildlife, including the endangered Piping plover (*Charadrius melodus*) and Least tern (*Sterna antillarum*). Recovery of Seabeach amaranth (*Amaranthus pumilus*), another endangered species, was also recorded. This report summarizes the results of all surveys, for analysis by Fire Island National Seashore (National Parks Service).

Methodology

Piping Plover/Least Tern Fencing and Monitoring

Fence Installation

Symbolic fencing was installed in areas designated at a site meeting in March 2006 between members of Fire Island National Seashore, U.S. Fish & Widlife Service, The Nature Conservancy and Land Use Ecological Services. Appendix A shows the location of symbolic fencing in the western Fire Island communities and Fire Island Pines.

Materials used to install fencing were: 66" carsonite flex rod posts (300), polypropelene/nylon twine (12 rolls), flags (12 rolls), "Do Not Enter" Signs (350). Posts were spaced thirty feet (30') apart, connected by polypropelene/nylon twine. Flags were placed every 8-10 feet apart, with 3-5 flags per section of twine. Signs were then placed on every third post, concentrated to every other post or every post around walkways and high traffic areas.

Monitoring

Monitoring for the entire project area was conducted three days per week at varying times and tides. The area was surveyed thoroughly using binoculars when necessary. On each visit, a Daily Site Visit Form was completed, including a GPS position and description of activity of any endangered Piping plovers or Least terns.

Seabeach Amaranth Surveys

Surveys were conducted for the presence of Seabeach amaranth, *Amaranthus pumilus*, once per month throughout the project area, weather permitting. The entire beach was surveyed and GPS position(s) of Seabeach amaranth plants were plotted on the ArcGIS map of the project area.

Results

Piping Plover/Least Tern Monitoring

Western Fire Island

Monitoring was conducted from April 3rd through June 30th. Surveys were performed three times per week during fair weather, in morning and afternoon hours at varying tides. There were neither Piping plovers nor Least terns observed during the monitoring period in this project area. However, other species observed within the fenced area and throughout the project site included Common terns, Herring gulls, Laughing gulls, Great black-backed gulls, American crow, pigeons, deer, dogs (loose and leashed), cats (loose), and people. Table 1 summarizes the dates and times of each survey.

Table 1. Monitoring results for the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

Month	Date	Time	Observations
April	4/3	1045	• No birds • Heavy beach traffic- tracks in symbolic fence area
	4/4	1000	• 5 Sandpipers • 1 Great black backed gull • 1 Herring gull • Extremely high tide into fencing area
	4/6	1050	• 8 Herring gulls • Evidence of heavy beach traffic- tracks in symbolic fencing • Tide still high
	4/10	1230	• No birds observed • Heavy beach traffic evident • Human and dog tracks observed in fence
	4/11	1000	• No birds observed • Repaired fencing
	4/14	0915	• No birds observed • Evidence of heavy beach traffic- tracks in symbolic fencing • Dog tracks within fencing • Repaired fencing
	4/17	1300	• No birds observed • Evidence of high tide • Heavy traffic evident in fencing area due to tide
	4/19	1230	• 6 Herring gulls
	4/20	1345	• 5 Herring gulls • Heavy beach traffic, deep ruts just seaward of fencing
	4/25	1200	• 10 Herring gulls • 1 American crow • Major fence repairs needed due to driving within fence
	4/27	1030	• 14 Herring gulls • 1 American crow (flying) • Evidence of vehicle, human, dog tracks in fence

Month	Date	Time	Observations
	4/28	1030	• 1 Laughing gull • 6 Herring gulls • Deer tracks within fencing • Kite flying observed ~200’ east of eastern fence boundary
May	5/2	1400	• 3 Herring gulls • Almost all fencing gone, knocked down • Beach severely eroded, 20’ width most areas
	5/4	1130	• 1 Laughing gull • 12 Herring gulls • Beach severely eroded, large sections of fencing washed away
	5/5	1000	• 8-10 Laughing gulls • Heavy beach traffic within fencing
	5/8	1200	• 4 Herring gulls • Beach still severely eroded • Existing fence repaired, no new fence installed
	5/11	1130	• 5 Laughing gulls • Beach still severely eroded with heavy beach traffic
	5/16	1130	• 5 Herring gulls • Beach still severely eroded • Removed fence near Pennant Walk due to beach erosion
	5/18	1320	• 1 American crow • 2 Herring gulls • Beach still severely eroded
	5/23	1300	• No wildlife • 10-15 people, 2-3 leashed dogs on beach • Beach still eroded, evidence of heavy beach traffic
	5/25	1415	• 2 Mallards • 10-15 Herring gulls • 15-25 people on beach, evidence of heavy beach traffic
	5/26	1000	• 1 Great black-backed gull • 1 Herring gull • Very dense fog (visibility <30’)
	5/30	1500	• No wildlife observed • Many people on beach, evidence of heavy beach traffic
June	6/1	1230	• 3 Herring gulls • 1 Common tern (flying) • Very hazy/foggy
	6/2	1130	• 2 Herring gulls (flying) • 3 Common terns (foraging in water) • 1 American crow
	6/6	1300	• 1 Cormorant (dead) • 2 Common terns • 2 Herring gulls (flying)
	6/8	1415	• 2 Herring gulls • Beach scarped 2-4’, beach elevation decreased such that snow fencing looks atop primary dune
	6/9	1315	• 2 Common terns (foraging)

Month	Date	Time	Observations
	6/12	1530	• 2 Herring gull • 1 Great black-backed gull • Beach appears to be recovering, scarp now a ridge
	6/13	1300	• 5 Great black-backed gulls • 3 Herring gulls • Many people on beach
	6/16	1015	• 3 Herring gulls • 1 Great black-backed gull • 1 Common tern • Many people on beach
	6/19	1145	• 1 Herring gull (flying)
	6/22	0930	• 11 Laughing gulls • 8 Herring gulls • 1 American crow
	6/23	1130	• 2 Common terns • Many people on beach
	6/26	1200	• 2 American crows • 4 Herring gulls • Many people on beach

As there were no observations of piping plovers in the project area, symbolic fencing was removed on June 30th with the exception of areas containing seabeach amaranth plants.

Fire Island Pines

Monitoring for Fire Island Pines was conducted from April 2nd through June 29th during fair weather, both in morning and afternoon hours. Please refer to Table 2 for an summary of monitoring efforts and results in Fire Island Pines. There was one Piping plover observed foraging within the project area on April 11th. Other species observed during the monitoring period included American crow, Great black-backed gull, Herring gull, Common tern, Pigeon, dogs (loose and leashed), and people. The birds were resting, flying, or foraging, and no nesting or breeding activity was seen.

Table 2. Monitoring results for Fire Island Pines.

Month	Date	Time	Observations
April	4/2	0830	• 1 Herring gull • 2 American crows
	4/3	1030	• No wildlife
	4/6	1100	• 17 Herring gulls • 4 American crows • 3 Pigeons
	4/9	0830	• No wildlife
	4/10	1100	• 3 Herring gulls • 3 Pigeons
	4/11	1045	• 1 Piping plover foraging near shoreline at Driftwood Walk (N 40º39.682' W 73º04.563') • 1 American crow • 3 Pigeons
	4/16	0830	• No wildlfie
	4/17	1130	• 3 Herring gulls • 2 American crows • 2 White-winged scoters (offshore) • 1 Pigeon
	4/21	0920	• 2 Herring gulls • 1 American crow
	4/23	0730	• No wildlife
	4/25	1200	• 4 Herring gulls • 2 American crows
	4/26	1600	• 6 Herring gulls • 2 American crows • 3 Pigeons
	4/30	0900	• No wildlife
May	5/1	1100	• No wildlife
	5/3	1300	• No wildlife
	5/7	1430	• Herring gulls • American crows • Many people on beach
	5/8	1030	• 2 Herring gulls • 8-10 people on beach
	5/10	1600	• No wildlife
	5/14	1200	• No wildlife
	5/17	0940	• No wildlife • Beach severely eroded, repaired fencing
	5/19	0700	• No wildlife
	5/23	1030	• 3 Herring gulls • Person w/leashed dog within fencing (spoke w/him)
	5/25	1100	• 3 Common terns (offshore) • 1 American crow • 10-15 people, 1 dog along beach (outside of fencing)
	5/30	1230	• 1 American crow • 20-30 people, 1 dog on beach
	5/31	1230	• No wildlife
June	6/2	1045	• 1 American crow • 2 people on beach

Month	Date	Time	Observations
	6/4	0800	• 3 Herrnig gulls • 2 Common terns (offshore) • 2 American crows
	6/6	1100	• 4 Herring gulls • 1 American crow • 4-5 people on beach
	6/9	1600	• 4 Herring gulls • 2 American crows • ~15 people on beach
	6/11	1100	• 6 Herring gulls
	6/13	1330	• No wildlife • Many people, dogs on beach
	6/15	1430	• 3 Common terns • 1 American crow • 25-35 people, couple dogs on beach
	6/19	1200	• 1 American crow • Tides ran high over weekend • Many people, dogs on beach
	6/21	1100	• 5 Laughing gulls • 1 Common tern (foraging in surf)
	6/24	1000	• No wildlife
	6/25	0900	• No wildlife
	6/27	1000	• 3 Herring gulls • 2 Great black-backed gulls
	6/28	0900	• Herring gulls • 1 Common tern • Many people on beach
	6/29	1000	• No wildlife

The Piping plover observed on April 11th was not seen in the project area subsequent to that date. Symbolic fencing was removed on June 30th with the exception of areas containing seabeach amaranth plants.

Seabeach amaranth Surveys

Western Fire Island

Seabeach amaranth, *Amaranthus pumilus*, was recorded throughout the western Fire Island project area from June through October. Six (6) individuals were recorded throughout the observation period. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Areas where Seabeach amaranth were recorded were fenced off for protection of the endangered plant. Figure 1 and Table 3 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 1. Seabeach amaranth observed locations in the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

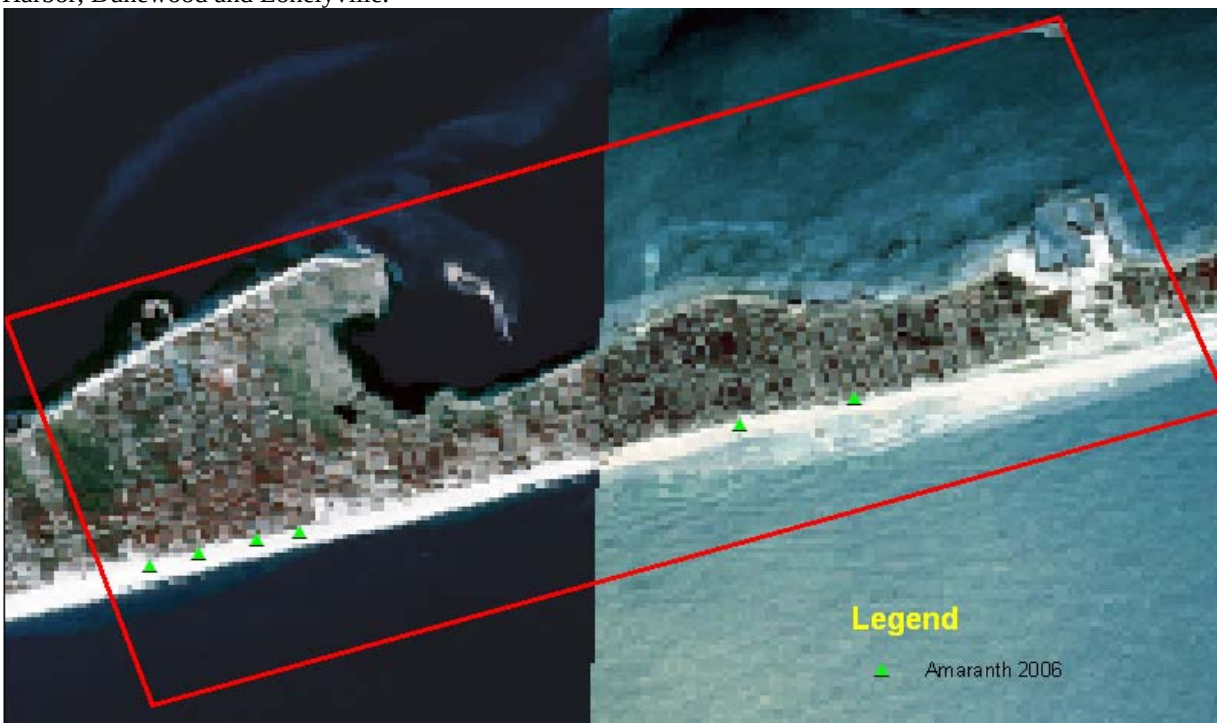

Table 3. Seabeach amaranth plants observed in Saltaire, Fair Harbor, Dunewood and Lonelyville.

Latitude	Longitude	Size	# Plants	Location (out from dune, etc.)
40º 38.051' N	73º 11.959' W	5"	1	Western boundary of Saltaire, 5' seaward of dune
40º 38.079' N	73º 11.877' W	4"	1	5th house east of western boundary of Saltaire, 10 landward of snow fence
40º 38.1029' N	73º 11.779' W	6"	1	100' west of Broadway (Saltaire) landward of snow fence
40º 38.116' N	73º 11.709' W	6"	1	100' east of Broadway (Saltaire) landward of snow fence
40º 38.296' N	73º 10.963' W	2.5"	1	30' east of Holly Walk (FH) at toe of dune
40º 38.335' N	73º 10.770' W	1.25"	1	100' west of Gull Walk West landward of snow fence

Fire Island Pines

Seabeach amaranth was recorded throughout Fire Island Pines from June through October. A total of one twenty-eight (28) plants were observed. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Areas where Seabeach amaranth were recorded were fenced off for protection of the endangered plant. Figure 2 and Table 4 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 3. Seabeach amaranth observed locations in Fire Island Pines.

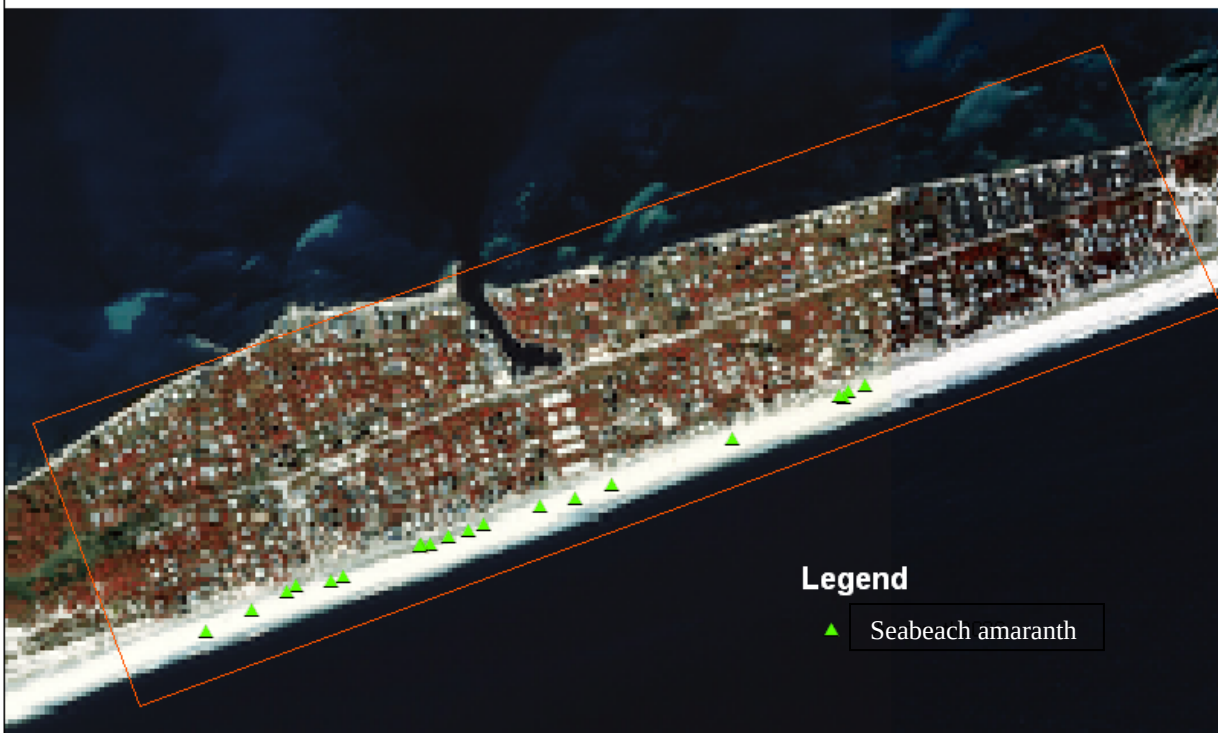

Table 4. Observations of Seabeach amaranth in Fire Island Pines.

Latitude	Longitude	Size	# Plants	Location
40º 39.905' N	73º 03.738' W	8"	1	25' west Ozone Walk, at toe of dune
40º 39.900' N	73º 03.757' W	3"	1	125' west Ozone Walk, at toe of dune
40º 39.892' N	73º 03.763' W	5"	1	150' west Ozone Walk, at toe of dune
40º 39.891' N	73º 03.768' W	6"	1	175' west Ozone Walk, at toe of dune
40º 39.857' N	73º 03.898' W	2.5"	1	40' east Nautilus Walk, 25' seaward of dune
40º 39.819' N	73º 04.046' W	1"	1	50' east of Harbor Walk, 30' seaward of dune
40º 39.806' N	73º 04.090' W	1"	1	70' east Atlantic Walk, 30' seaward of dune
40º 39.800' N	73º 04.135' W	0.75"	1	115' west Atlantic Walk, 30' seaward of dune
40º 39.786' N	73º 04.203' W	1"	1	50' east Cedar Walk, 20' seaward of dune
40º 39.779' N	73º 04.220' W	3-5"	4	20' west Cedar Walk, 30' seaward of dune
40º 39.775' N	73º 04.244' W	0.5-1"	3	100' west Cedar Walk, 30' seaward of dune
40º 39.767' N	73º 04.266' W	0.5"	1	250' west Cedar Walk, 50' seaward of dune
40º 39.768' N	73º 04.277' W	0.5-0.75"	2	300' west Cedar Walk, 50' seaward of dune
40º 39.766' N	73º 04.280' W	2"	1	310' west Cedar Walk, 50' seaward of dune
40º 39.739' N	73º 04.373' W	5-7"	2	100' east Coast Guard Walk, 25' seaward of dune
40º 39.736' N	73º 04.387' W	8"	1	25' east Coast Guard Walk, 15' seaward of dune
40º 39.733' N	73º 04.430' W	0.75-1.5"	2	60' west Coast Guard cut, 20' seaward of dune
40º 39.725' N	73º 04.442' W	1"	1	100' west Coast Guard cut, 10' seaward of dune
40º 39.711' N	73º 04.485' W	0.75"	1	150' west Driftwood Walk, 10' seaward of dune
40º 39.692' N	73º 04.541' W	6"	1	100' east Sandy Walk, 5' seaward of dune

Discussion and Conclusions

Western Fire Island communities of Saltaire, Fair Harbor, Dunewood, and Lonelyville, and the community of Fire Island Pines, have seen a slight decrease in the number of Seabeach amaranth plants colonizing the beaches. However, the presence and abundance of vegetation such as American beach grass, Seaside spurge, Beach pea, and other species previously observed appears to be constant over the three year term following renourishment. Areas known for abundant vegetation, such as central Fire Island Pines, continue to flourish. The western communities, where vegetation is very sparse, have not seen an increase or decrease in presence or abundance in vegetative cover.

Although there was one Piping plover observed, the individual was solitary and foraging at the shoreline. There were no observations of pairs, nor was there any evidence of plover nesting. This is consistent with observations over the last three years, as none of the communities are known to be Piping plover nesting sites.

Western Fire Island and Fire Island Pines Beach Nourishment Project

2005 Environmental Monitoring Report

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Introduction

Following the Fall 2003/Winter 2004 beach nourishment projects at Fire Island, monitoring was conducted to assess the recovery of flora and fauna inhabiting the beaches. Surveys were conducted for birds and wildlife, including the endangered Piping plover (*Charadrius melodus*) and Least tern (*Sterna antillarum*). Recovery of vegetation and invertebrates in beach areas was also recorded, including specific observations of Seabeach amaranth (*Amaranthus pumilus*), another endangered species. This report summarizes the results of all surveys, for analysis by Fire Island National Seashore (National Parks Service).

Methodology

Piping Plover/Least Tern Fencing and Monitoring

Fence Installation

Symbolic fencing was installed in areas designated at a site meeting in March 2005, between members of Fire Island National Seashore, U.S. Fish & Widlife Service, The Nature Conservancy and Land Use Ecological Services. Appendix A shows the location of symbolic fencing in the western Fire Island communities and Fire Island Pines.

Materials used to install fencing were: 66" carsonite flex rod posts (300), polypropelene/nylon twine (12 rolls), flags (12 rolls), "Do Not Enter" Signs (350). Posts were spaced thirty feet (30') apart, connected by polypropelene/nylon twine. Flags were placed every 8-10 feet apart, with 3-5 flags per section of twine. Signs were then placed on every third post, concentrated to every other post or every post around walkways and high traffic areas.

Monitoring

Monitoring for the entire project area was conducted three days per week at varying times and tides. The area was surveyed thoroughly using binoculars when necessary. On each visit, a Daily Site Visit Form was completed; including a GPS position of any endangered Piping plovers or Least terns. Bird data was entered into a database and plotted in ArcGIS, to obtain a map with positions of birds found. This map and supporting database information were forwarded to NPS as needed.

Vegetation Surveys

Vegetation surveys were conducted once per month throughout the project area, weather permitting. Vegetation was inventoried utilizing the transect method. Transects were established along existing section lines, approximately 900-1,100 feet apart. Species identification and abundance were inventoried out five feet (5') to the west and five feet (5') to the east of each transect line, for a total transect width of ten feet (10').

Vegetation was photographed and a GPS position of any threatened or endangered species, especially Seabeach amaranth (*Amaranthus pumilus*), was recorded.

GPS position(s) of threatened/endangered species were plotted on the ArcGIS map of the project area.

Invertebrate Surveys

Invertebrate surveys were conducted twice per year to determine species diversity and biomass, to compare nourished and reference sites.

Sample Sites

There were two sample sites within the project areas. In the western communities, sampling was done south of Crest Walk (SFD11). In Fire Island Pines, sampling was done south of Harbor Walk (FIP7).

Data from the renourishment areas was compared with two "control" studies, the US Army Corps of Engineers Beach and Invertebrate Survey for the Reformulation Study, and a National Parks Service Technical Report on Ocean Beach Invertebrates.

Sampling Methodology

Sampling methods were taken from the U.S. Army Corps of Engineers Placement Area Invertebrate Sampling for the Reformulation Study. Samples were taken using a transect method twice each year (spring and fall). Each transect ran from the base of the fore dune to the edge of the wash zone. Physical characteristics were noted for each sample site. Each site required two days of sampling.

Core Samples

Core samples were used to catch burrowing animals. To collect the sample, a 3" diameter, 8" long plastic corer was used. The samples were then sieved through a 0.5 mm stainless sieve and organisms identified where possible. Any organisms not identified were bottled and preserved in formalin for later analysis.

On day one, core samples were taken from each site at the following locations along the transect line: (1) at the most recent high tide line (regardless of the presence of wrack), (2) at the low tide surf zone, and (3) in the middle of the tide lines. On day two, one core sample from the wrack line was taken following the sight sample, where insecticide was used to stun organisms.

Sight Samples

Sight samples were taken within the wrackline on day two. One sight sample was taken along each transect. To sample, a $0.075m^2$ quadrat was placed over the wrack to designate the sampling area. A rectangular sieve was then placed over the quadrat, and a light, steady mist of insecticide was sprayed through the sieve mesh onto the wrack. The sieve was then removed and the wrack searched for five minutes for organisms. Organisms that were not identified in the field were bottled and preserved with formalin for later analysis. If the wrack was too thick to sort thoroughly within the allotted five minute period, the bucket-floatation method was used. With this method, the wrack sample is submerged in a white bucket of seawater to catch organisms that float to the surface.

Pitfall Trap Sampling

Pitfall traps were set within the wrackline (1), supratidal (1) and beach grass areas (1) of each transect line for 24 hours. The traps consisted of 0.5 L (16 oz.) plastic solo or comparable cups buried level with the sand surface and partially filled with soapy water. After the sampling period, the contents within each trap were placed in Ziploc bags or comparable containers and placed in a cooler for analysis in the lab.

The methods described above yielded eight (8) samples from each transect line in the spring, and another eight (8) samples in the fall, for a total of sixteen (16) samples per year for each transect.

Data Analysis

Organisms were identified in the field where possible. Any organisms not identified in the field were preserved in formalin and transported to the lab for analysis. The organisms were picked, sorted and identified to the lowest practical taxa.

Results

Piping Plover/Least Tern Monitoring

Western Fire Island

Monitoring was conducted from April 1st through July 1st. Surveys were performed three times per week during fair weather, in morning and afternoon hours at varying tides. There were neither Piping plovers nor Least terns observed during the monitoring period in this project area. However, other species observed within the fenced area and throughout the project site included Common terns, Herring gulls, Laughing gulls, Great Black Backed gulls, Crow (tracks), pigeons, deer, dogs (loose and leashed), cats (loose), and people. Table 1 outlines the dates and times of each survey.

Table 1. Monitoring results for the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

Month	Date	Time	Observations
April	3/31	1145	• 5-7 herring gulls • Deer tracks on beach
	4/4	1000	• No wildlife
	4/6	1600	• 17-20 herring & black backed gulls
	4/7	1400	• 23-27 gulls (2 dead) • 2 crows
	4/11	1500	• 2 herring gulls • 1 black backed gull
	4/14	1430	• 10-12 herring gulls • 203 black backed gulls
	4/15	1330	• 3-5 gulls
	4/18	1130	• 3-5 herring gulls • 2 people w/in fenced area

Month	Date	Time	Observations
	4/20	1030	• 25-28 herring gulls • Dog, deer, human tracks w/in fence area
	4/22	1000	• Heavy vehicle traffic • No wildlife
	4/25	1200	• No wildlife • High tide over wknd to dune; evidence of vehicle, human, dog tracks in fence; lots debris on beach
	4/26	1400	• 1 black backed gull • evidence of vehicle traffic w/in fence; repaired
	4/28	1030	• 1 herring gull • 2 blackbirds • evidence of very high tide again
May	5/2	1300	• no wildlife
	5/4	1400	• 2 black backed gulls • 6-9 herring gulls
	5/6	1000	• no wildlife
	5/10	1200	• no wildlife • vehicle traffic w/in fence most of WFI due to high tide; repaired
	5/11	1100	• 6 herring gulls
	5/13	1200	• 4 black backed gulls (BBG) • 5 herring gulls (HG) • 1-2 common terns (flying) • 1 crow
	5/17	1030	• no wildlife
	5/19	0930	• no wildlife
	5/20	1100	• 4-6 black backed gulls • 3 herring gulls (1 dead) • 2-3 common terns (flying)
	5/23	1600	• 3-4 BBG • 10-15 HG • 1 crow • 6-9 blackbirds, 15 sparrows
	5/27	0930	• 6 HG • 2 common terns • vehicle traffic through length of WFI; repaired
	5/31	1200	• no wildlife
June	6/2	1500	• no wildlife • people w/in fence area asked to move
	6/3	1000	• 2BBG • 2HG • lots of debris on beach
	6/6	1600	• 2 common terns • 2 BBG • 1 loose dog
	6/7	1315	• 2 crows
	6/8	1230	• 1 crow • 1 BBG

Month	Date	Time	Observations
	6/13	1000	• 2 HG • 1 pigeon
	6/15	1430	• no wildlife
	6/17	1000	• loose dog • 1 dead HG
	6/21	1500	• 3BBG • 5 laughing gulls • 3 loose dogs
	6/22	1100	• 3 crows (1 dead) • 1HG
	6/24	0900	• no wildlife
	6/28	1430	• no wildlife
July	7/1	0700	• no wildlife

As there were no observations of piping plovers in the project area, symbolic fencing was removed on July 1st, with the exception of areas containing seabeach amaranth plants.

Fire Island Pines

Monitoring for Fire Island Pines was conducted from April 1st through July 1st during fair weather, both in morning and afternoon hours. Please refer to Table 2 for an outline of monitoring efforts and results in Fire Island Pines. Species observed during the monitoring period included Crows, Great Black Backed gulls, Herring gulls, Common terns, pigeons, dogs (loose and leashed), and people. The birds were resting, and no nesting or breeding activity was seen.

Table 2. Monitoring results for Fire Island Pines.

Month	Date	Time	Observations
April	4/4	1100	• no wildlife
	4/6	1430	• no wildlife
	4/10	0600	• 1 Herring gull (HG) • 2 crows
	4/11	1830	• no wildlife (windy)
	4/14	1100	• 2-3 HG
	4/15	1300	• 2 HG • 3 crows
	4/16	0630	• no wildlife
	4/18	1200	• 3 HG • 3 crows • 1 leashed dog
	4/21	1200	• no wildlife
	4/22	1500	• no wildlife
	4/24	1330	• no wildlife
	4/25	1515	• no wildlife
	4/27	1230	• 1 HG • 2 crows • 6 sanderlings
May	5/2	1400	• 2 HG
	5/4	1300	• 2 HG

Month	Date	Time	Observations
			• 2 crows
	5/5	1400	• HG
	5/8	1500	• no wildlife
	5/10	1300	• 1 HG • 4 crows
	5/11	1800	• no wildlife
	5/15	1500	• 4 crows • 3 terns offshore • 10-12 people on beach (none in fence)
	5/16	1630	• 2 gulls
	5/19	1300	• 2 HG • 6 crows • 1 dog walker (leashed)
	5/22	1500	• no wildlife
	5/23	1500	• 3 HG • 4 crows
	5/27	1200	• 2 common terns offshore • major fence repairs; vehicles through fence
	5/30	1630	• no wildlife; lots of people
June	6/1	1400	• 4 crows
	6/6	1300	• 3000' fence cut east half of FIP; repaired
	6/7	1400	• no wildlife • 3 dogs
	6/9	1700	• no wildlife
	6/13	1800	• common terns offshore • 40+ people on beach
	6/14	1200	• no wildlife
	6/16	1100	• no wildlife (very foggy)
	6/21	1100	• no wildlife
	6/23	1030	• no wildlife
	6/25	1800	• no wildlife
	6/26	1800	• no wildlife

There were no observations of piping plovers in the project area. Symbolic fencing was removed on July 1st, with the exception of areas containing seabeach amaranth plants.

Vegetation Surveys

Western Fire Island

Vegetation surveys were conducted in western Fire Island communities on June 22, July 19, August 18, September 16, and October 18. There were seven transects established within the renourishment area, and one control transect west of the renourishment area (Figure 2, Table 3).

Table 3. Transects for western Fire Island vegetation surveys.

ID	CPE Map Location	Descriptive Location	Lat	Long

W-1	SFD4	south of Beach Walk	N40 38.073'	W73 11.856'
W-2	SFD7	south of Navy Walk	N40 38.125'	W73 11.647'
W-3	SFD8	south of Pennant Walk	N40 38.164'	W73 11.498
W-4	F16	south of Broadway (border of Saltaire/Fair Harbor)	N40 38.221'	W73 11.272
W-5	SFD15	south of Pine Walk	N40 38.275'	W73 11.054'
W-6	F18	south of Sandpiper Walk	N40 38.330'	W73 10.763'
W-7	SFD21	eastern border of fencing	N40 38.408'	W73 10.456'
C-1	control	~ 200' west of western project boundary	N40 38.051'	W73 11.974'

Vegetation was observed in all surveys to varying degrees. Species observed included *Ammophila breviligulata* (American beach grass), *Lathyrus japonicus* (Beach pea), *Chamaesyce polygonifolia* (Seaside spurge), *Polygonum glaucum* (Seaside knotweed), *Artemisia steleriana* (Dusty miller), and *Amaranthus pumilus* (Seabeach amaranth). Appendix B-1 outlines the survey results for each date.

To analyze whether the vegetative growth was significantly different in renourished areas versus control areas, a Model I ANOVA test was run. The test compared the quantity of *Ammophila breviligulata* in each transect and each control. Please note that both controls were used, as the WC1 control had no fencing, while the PC1 control had symbolic fencing similar to the renourished areas. Table 4 (below) shows the results of the ANOVA test.

Table 4. ANOVA table for quantity of *Ammophila breviligulata*.

	df	SS	MS	F_s
Y_{bar}-Y_{2bar}	8	5177	647.1	6.667 (P<0.001)
Y-Y_{bar}	36	3494	97.07	
Y-Y_{2bar}	44	8671		

Source of Variation	df	SS	MS	Fs
Among groups (renourished areas)	8	5177	647.1	
Renourished vs. WC1	6	637.2	106.2	1.094 *ns*
Renourished vs. PC1	6	1034	172.4	1.776 *ns*

The results of the ANOVA test show that, although there is significant variation with respect to quantity of *Ammophila breviligulata*, the variation is not due to the "treatment" of beach renourishment.

In addition to vegetation transects, Seabeach amaranth was recorded throughout the western Fire Island project area. Eight (8) individuals were recorded throughout the observation period. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Areas were Seabeach amaranth were recorded were fenced off for protection of the endangered plant. Figure 2 and Table 5 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 2. Vegetation transect locations , invertebrate transect location, and Seabeach amaranth observed locations in the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

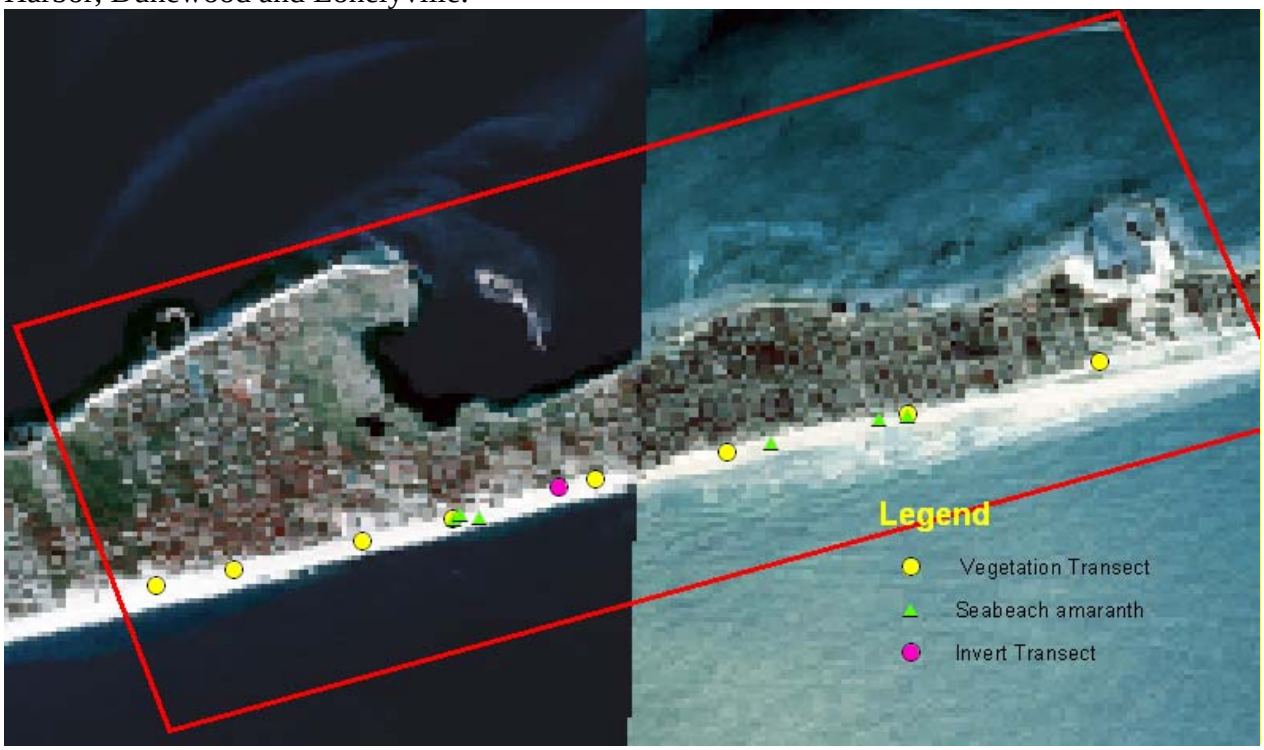

Table 5. Observations of Seabeach amaranth in western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

Latitude	Longitude	Size	# Invididuals	Location (out from dune, etc.)
40 38.164	73 11.498	1"	2	out 25'
40 38.170	73 11.469	1.5"	1	front of L.Claiborne, out 5'
40 38.165	73 11.456	1.5	1	front of L.Claiborne, out 60'
40 38.284	73 10.984	1"	1	25' off dune; 2' seaward snow fence
40 38.325	73 10.811	3"	1	3' off dune; landward of snow fence
		0.5"	1	30 from snow fence; 40' west (east) walk
40 38.330'	73 10.763'	2.5"	1	5' W of W6 on dune

Fire Island Pines

Vegetation transect surveys were conducted in Fire Island Pines on June 23, July 19, August 18, September 16, and October 18. Six transects were established within the renourishment area, with one control transect east of the eastern project boundary (Figure 3, Table 6).

Table 6. Transect locations for Fire Island Pines.

ID	CPE Map Location	Descriptive Location	Lat	Long
P-1	FIP2	~ 150' east of western fencing boundary	N40 39.684'	W73 04.611'
P-2	FIP4	south of Coast Guard Walk	N40 39.738'	W73 04.396'
P-3	F40	south of Widgeon Walk	N40 39.795'	W73 04.159'
P-4	FIP8	south of Neptune Walk	N40 39.845'	W73 03.951'
P-5	FIP10	south of Shell Walk	N40 39.885'	W73 03.742'
P-6	FIP12	~150' west of Fishermans Walk	N40 39.945'	W73 03.527'
P-7	FIP14	~225' east of Sail Walk	N40 39.998'	W73 03.348'

Vegetation was observed in all surveys to varying degrees. Species observed included *Ammophila breviligulata* (Beach grass), *Lathyrus japonicus* (Beach pea), *Chamaesyce polygonifolia* (Seaside spurge), *Polygonum glaucum* (Seaside knotweed), *Artemisia steleriana* (Dusty miller), and *Amaranthus pumilus* (Seabeach amaranth). Appendix B-2 outlines the survey results for each date.

As with the Western Fire Island project area, analysis on whether the vegetative growth was significantly different in renourished areas versus control areas was performed for the Fire Island Pines project area. A Model I ANOVA test was run to compare the quantity of *Ammophila breviligulata* in each transect and each control. Please note that both controls were used, as the WC1 control had no fencing, while the PC1 control had symbolic fencing similar to the renourished areas. Table 7 (below) shows the results of the ANOVA test.

Table 7. ANOVA table for quantity of *Ammophila breviligulata*.

	df	SS	MS	F_s
Y_{bar}-Y_{2bar}	8	67966	8495.7	16.625 (P<.001)
Y-Y_{bar}	36	18396	511.01	
Y-Y_{2bar}	44	86362		

Source of Variation	df	SS	MS	Fs
Among groups (renourished areas)	8	67966	8495.7	
Renourished vs. WC1	5	13726	2745.3	5.3723 *ns*
Renourished vs. PC1	5	6322.1	1264.4	2.4743 *ns*

Again, the results of the ANOVA test show that, although there is significant variation with respect to quantity of *Ammophila breviligulata*, the variation is not due to the "treatment" of beach renourishment.

In addition to vegetation transects, Seabeach amaranth was recorded throughout Fire Island Pines. A total of one hundred eighty eight (188) plants were observed. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Areas where Seabeach amaranth were recorded were fenced off for protection of the endangered plant. Figure 3 and Table 8 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 3. Vegetation transect locations, invertebrate transect location and Seabeach amaranth observed locations in Fire Island Pines.

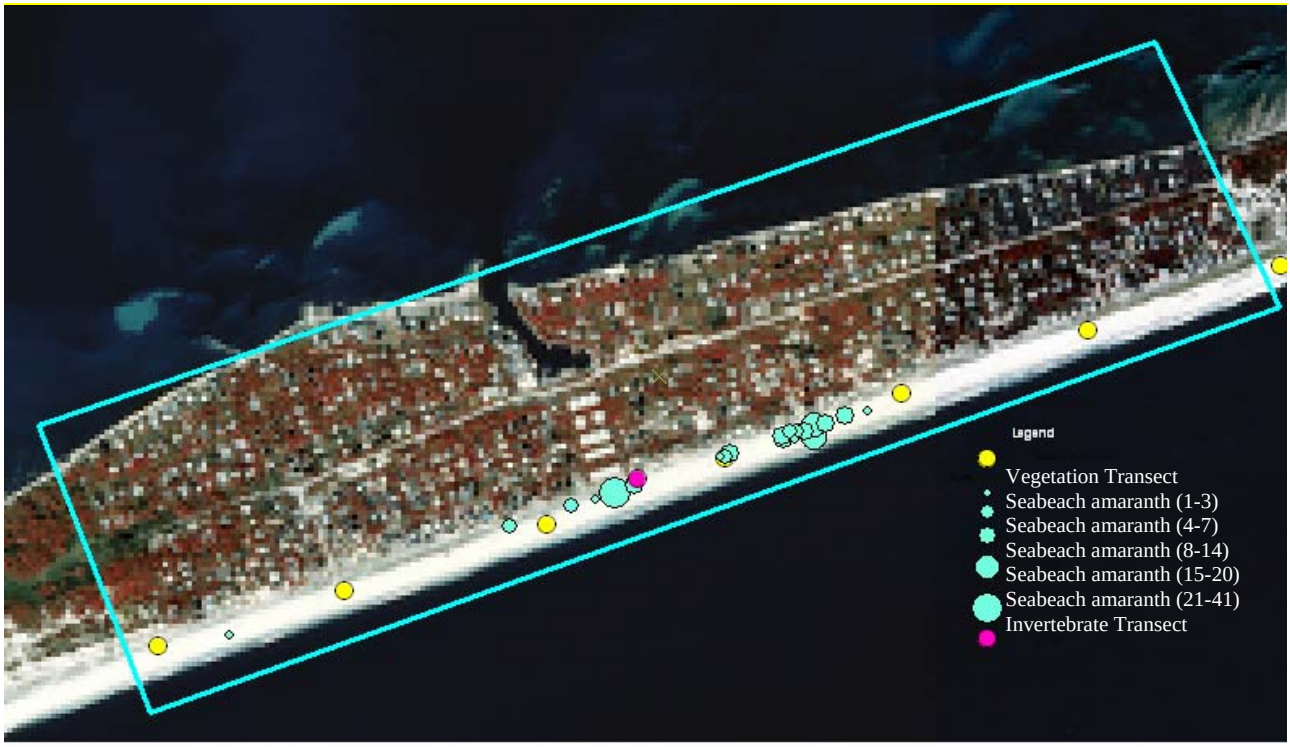

Table 8. Observations of Seabeach amaranth in Fire Island Pines.

Latitude	Longitude	Location	Size	# Plants
40 39.694	73 04.530	2 plants showing evidence of predation, symbolic fencing still in place	0.5-1.5”	2
40 39.785	73 04.201	1 plant showing evidence of predation, 3 with none	0.5-2”	4
40 39.804	73 04.129	2 plants showing evidence of predation, 5 with none	0.75-3”	7
40 39.810	73 04.102	1 plant showing evidence of predation	1”	1
40 39.814	73 04.079	15 plants showing evidence of predation, 26 with none	0.25-5”	41
40 39.817	73 04.057	out 10-15' 6 plants showing evidence of predation, 8 with none	0.125-0.5"	14
40 39.845	73 03.951	out 10-15'	0.125-0.5"	5
40 39.846	73 03.956	out 10-15'	0.125-1"	2
40 39.849	73 03.945	out 10-15'	0.125-1"	10
40 39.863	73 03.884	out 10-15' 2 plants showing evidence of predation, 7 with none	0.125-1"	9
40 39.861	73 03.882	out 30'	0.5-1.5"	11
40 39.865	73 03.875	out 10' 1 plant showing evidence of predation, 3 with none	0.25"	4
40 39.867	73 03.867	out 30' 1 large, 2 small plants showing evidence of predation, 2 with none	0.5-1.5"	5
40 39.866	73 03.858	out 30' 5 plants showing evidence of predation, 7 with none	1-2"	12
40 39.871	73 03.847	out 30' 9 plants showing evidence of predation, 11 with none	1-2"	20
40 39.871	73 03.833	out 30' 4 plants showing evidence of predation, 5 with none	0.25-2.5"	9
40 39.880	73 03.811	out 30' 2 plants showing evidence of predation, 6 with none	0.25-1"	8
40 39.883	73 03.785	out 30'	0.25-1"	3

Invertebrate Surveys

Spring invertebrate surveys were conducted July 19-20 for western Fire Island and July 21-22 for Fire Island Pines. A detailed report of invertebrate survey results for both project locations can be found in Appendix C-1. Sampling locations are found on Figures 1 and 2.

Fall invertebrate samples were collected October 17-18 for western Fire Island and October 27-28 for Fire Island Pines. A detailed report of invertebrate survey results for both project locations can be found in Appedix C-2.

To compare the effects of beach nourishment on benthic invertebrates, the results from these surveys were compared to two additional invertebrate studies, one conducted by the US Army Corps of Engineers (USACOE) and one for the National Parks Service conducted as a master’s thesis by a SUNY Stony Brook student. Table 9 compares the overall results of each study, as well as the 2004 renourishment invertebrate study. Although sample sizes were too small for statistical comparison, it appears that the re-nourished recovered to pre-construction conditions as early as 2004. High variability between sites and seasons was shown in the USACOE and NPS studies, both of which

demonstrated that the sites nearest the re-nourished areas have among the lowest abundances. This indicates that the project area was never a highly abundant area for benthic invertebrates.

However, the dominant groups—nematodes, oligochaetes, and amphipods—have returned to the re-nourished areas. Their abundances hold steady over the 2004-2005 sampling seasons, indicating a recovered benthic invertebrate base.

Table 9. Comparison of four (4) invertebrate studies on Fire Island, Atlantic ocean side.

Invert Study		USACOE* (January 2005)	NPS** (June 1999)	LUES*** (December 2004)	LUES*** (December 2005)
***N* Sample Sites**		12	6	2	2
n samples		192	192	32	32
Core Samples	**Dominant Taxa**	Nematoda, Oligochaeta	Amphipoda	Bivalvia (*Mytilus edulis)*, Nematoda	Nematoda, Oligochaeta
	# Organisms	4454	338	143	118
Pitfall Traps	**Dominant Taxa**	Amphipoda (*Talorchestia longicornus*)	Amphipoda (*T. longicornus*)	Hymenoptera (Formicidae)	Coleoptera (*Notoxus* spp.), Amphipoda (*T. longicornus*)
	# Organisms	527	4597	63	66
Wrack Sight Samples	**Dominant Taxa**	Amphipoda	Coleoptera (*Phaleria testacea*)	Bivalvia (*M. edulis*)	Decapoda (*Emerita talpoida*)
	# Organisms	71	887	1175	2

*USACOE, Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York, Reformulation Study Beach and Intertidal Invertebrate Study (Note: only ocean sites data used)

**Kluft Steinbeck, J.M.The Ocean Beach Invertebrates of Fire Island National Seashore, New York: Spatial and Temporal Trends and the Effects of Vehicular Disturbance. Technical Report NPS/BSO-RNR/NRTR/00-7. 252pp. (Note: wrack sight and wrack core samples were combined in this study)

***Land Use Ecological Services, Inc., Western Fire Island and Fire Island Pines Beach Nourishment Project

Discussion and Conclusions

Environmental conditions in the re-nourished sites of western Fire Island (Saltaire, Fair Harbor, Dunewood and Lonelyville) and Fire Island Pines have returned to a pre-construction state or better. Piping plovers and least terns have not used the project areas for nesting traditionally, nor do they following re-nourishment. Vegetation has actually re-established along several stretches of both project areas, with the presence of Seabeach amaranth now where there was none documented prior to re-nourishment. Finally, benthic invertebrates have returned to the project areas in numbers comparable to pre-construction abundances. Therefore, in conclusion, recovery of the Western Fire Island and Fire Island Pines project areas has occurred within the 12-18 month timeframe typical of beach restoration projects.

Appendix A—Fencing and Transect Locations

(Symbolic fence and transect plans were submitted as paper copies to FINS in 2005.)

Appendix B—Vegetation Surveys

Vegetation survey results for western Fire Island and Fire Island Pines. Sub-appendix B-1 depicts results for western Fire Island; sub-appendix B-2 has results from Fire Island Pines.

Sub-Appendix B-1 Western Fire Island Vegetation Surveys

June 22, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
W1	*Ammophila breviligulata*	<1"	1	N 40 38.073	W 73 11.856	
W2	*Ammophila breviligulata*	1-3"	11	N40 38.125	W73 11.647	out 10'
	Cakile edentula	1",3"	2			
	Chamaesyce polygonifolia	2",5"	2			
W3	*Ammophila breviligulata*	<1-4"	33	N40 38.164	W73 11.498	out 40'
	Cakile edentula	2-6"	8			
	Chamaesyce polygonifolia	2"	1			
	Lathyrus japonicus	1"	1			
	Amaranthus pumilus	1"	1			out 25'
W4	*Ammophila breviligulata*	4"	4	N40 38.221	W73 11.272	toe of dune (snow fence mangled)
	Chamaesyce polygonifolia	3"	1			
W5	*Ammophila breviligulata*	<1-4"	20	N40 38.275	W73 11.054	(lots garbage at this transect)
W6	*Cakile edentula*	5"	1	N40 38.330	W73 10.763	
W7	*Ammophila breviligulata*	<1"	5	N40 38.408	W73 10.456	out 5'
	Cakile edentula	7"	1			
C1	*Ammophila breviligulata*	1"	2	N40 38.051	W73 11.974	no snow fence, veg 5' sw dune
	Cakile edentula	3"	1			

July 19, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
W1	*Ammophila breviligulata*	<1"	6	N40 38.073'	W73 11.856'	
W2	*Ammophila breviligulata*	2-5"	10	N40 38.125'	W73 11.647'	out 10'
	Cakile edentula	2",8"	2			
	Chamaesyce polygonifolia	4",12"	2			
W3	*Ammophila breviligulata*	1-4"	34	N40 38.164'	W73 11.498	out 40'
	Cakile edentula	3-12"	7			
	Chamaesyce polygonifolia	1-6"	12			
	Amaranthus pumilus	5"	1			out 25'
W4	*Ammophila breviligulata*	<1"	3	N40 38.221'	W73 11.272	toe of dune (snow fence mangled)
	Salsola kali	6"	1			
W5	*Ammophila breviligulata*	1-4"	24	N40 38.275'	W73 11.054'	(lots garbage at this transect)
	Salsola kali	3"	1			
W6	*Ammophila breviligulata*	<1"	2	N40 38.330'	W73 10.763'	
	Salsola kali	5"	1			
	Cakile edentula	5"	1			
W7	*Ammophila breviligulata*	1-4"	53	N40 38.408'	W73 10.456'	out 5'
	Cakile edentula	2.5"	1			
C1	*Ammophila breviligulata*	1-2"	7	N40 38.051	W73 11.974	no snow fence, vegetation 5'
	Chamaesyce polygonifolia	1-5"	11			

	Cakile edentula	3"	2			sw dune

August 18, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
W1	*Ammophila breviligulata*	1-3"	10	N40 38.073'	W73 11.856'	9 plants on dune slope or at toe of dune
	Chamaesyce polygonifolia	1/4-2"	5			All plans on dune slope or at toe of dune
W2	*Ammophila breviligulata*	1-4"	34	N40 38.125'	W73 11.647'	1.5' from fencing
	Cakile edentula	1.5"	2			
	Chamaesyce polygonifolia	1-3"	7			
	Salsola kali	1/2-1"	2			
W3	*Amaranthus pumilus*	4"	1	N40 38.164'	W73 11.498	15' from fencing
	Ammophila breviligulata	1-4"	34			35' from fencing
	Cakile edentula	3"-2'	7			40' from fencing
	Chamaesyce polygonifolia	1-5"	12			30' from fencing
	Polygonum glaucum	1-6"	3			30' from fencing
	Salsola kali	10"	1			8' from fencing
W4	*Ammophila breviligulata*	1"	3	N40 38.221'	W73 11.272	On dune slope
	Chamaesyce polygonifolia	1.5"	1			
W5	*Ammophila breviligulata*	1-4"	22	N40 38.275'	W73 11.054'	
	Chamaesyce polygonifolia	1-3"	5			
W6	*Ammophila breviligulata*	1"	1	N40 38.330'	W73 10.763'	
	Cakile edentula	1"	1			
	Chamaesyce polygonifolia	2-4"	3			
	Salsola kali	16"	1			
W7	*Ammophila breviligulata*	<1 -6"	28	N40 38.408'	W73 10.456'	10' from old snowfence
	Cakile edentula	3'	1			
C1	*Ammophila breviligulata*	1"	0	N40 38.051	W73 11.974	On dune slope or at toe of dune
	Chamaesyce polygonifolia	1/4"-4"	14			

September 16, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
W1	*Ammophila breviligulata*	<1"	1	N40 38.073'	W73 11.856'	
W2	*Ammophila breviligulata*	1-6"	10	N40 38.125'	W73 11.647'	
	Cakile edentula	10"	1			
	Salsola kali	5", 12"	2			
W3	*Amaranthus pumilus*	4"	1	N40 38.164'	W73 11.498	15' from fencing
	Ammophila breviligulata	1-5"	26			30' from fencing
	Lathyrus japonicus	3"	1			3' from fencing
	Chamaesyce polygonifolia	1-3"	4			27' from fencing
	Polygonum glaucum	6",8"	2			30' from fencing
W4	*Chamaesyce polygonifolia*	2-3"	3	N40 38.221'	W73 11.272	On dune slope
W5	*Ammophila breviligulata*	1-4"	18	N40 38.275'	W73 11.054'	
W6	*Ammophila breviligulata*	<1"	1	N40 38.330'	W73 10.763'	
	Salsola kali	16"	1			
W7	*Ammophila breviligulata*	<1-2"	5	N40 38.408'	W73 10.456'	
	Cakile edentula	1"	1			
C1	*NO VEGETATION FOUND*			N40 38.051	W73 11.974	

October 18, 2005

Transect	Species	Size	# Invididuals	Snow Fence		Location (out from dune, etc.)
				SW	LW	
W1	*NO VEGETATION FOUND*		0	0	0	
W2	*Ammophila breviligulata*	1-3"	5	0	5	
W3	*Ammophila breviligulata*	1-3"	27	15	12	out 30'
	Cakile edentula	3",6"	2	2	0	out 15'
W4	*NO VEGETATION FOUND*					
W5	*Ammophila breviligulata*	1-4"	14	0	14	between dune and snow fence
W6	*Ammophila breviligulata*	3"	2	0	2	
	Salsola kali	12"	1	0	1	
W7	*Ammophila breviligulata*	1-6"	16	5	11	out 2'
	Lathyrus japonicus	3-10"	4	0	4	
C1	*NO VEGETATION FOUND*					

Sub-Appendix B-2 Fire Island Pines Vegetation Surveys

June 23, 2005

Transect	Species	Size	# Invididuals	Latitude	Longitude	Location (out from dune, etc.)
P1	*Ammophila breviligulata*	<1-4"	18	N40 39.684'	W73 04.611'	out 25'
P2	*Ammophila breviligulata*	<1-4"	40	N40 39.738'	W73 04.396'	out 40'
P3	*Ammophila breviligulata*	<1-6"	108	N40 39.795'	W73 04.159'	from 20' sw dune to 70' sw dune
	Cakile edentula	1",1",1"	3			
P4	*Ammophila breviligulata*	1-5"	105	N40 39.845'	W73 03.951'	out 60' (amaranth out ~10')
	Cakile edentula		4			
	Lathyrus japonicus	4-18"	10			
	Chamaesyce polygonifolia	0.25-0.5"	4			
	Amaranthus pumilus	0.125-0.5"	3			
P5	*Ammophila breviligulata*	<1-4"	49	N40 39.885'	W73 03.742'	
P6	*Cakile edentula*	6"	1	N40 39.945'	W73 03.527'	
P7	*Ammophila breviligulata*	<1-1"	17	N40 39.998'	W73 03.318'	out 25'

July 21, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
P1	*Ammophila breviligulata*	various	26	N40 39.684'	W73 04.611'	no snow fence, veg. out 15'
	Lathyrus japonicus	1"	1			
	Chamaesyce polygonifolia	<3"	50			
	Cakile edentula	1"	1			
P2	*Ammophila breviligulata*	various	59	N40 39.738'	W73 04.396'	out 50'
	Chamaesyce polygonifolia	<3"	2			
P3	*Ammophila breviligulata*	various	150	N40 39.795'	W73 04.159'	from 30' sw dune to 110' sw dune
	Chamaesyce polygonifolia	<3"	100			
	Artemisia stelleriana	3", 6"	2			
	Cakile edentula	6"	1			
P4	*Ammophila breviligulata*	various	120	N40 39.845'	W73 03.951'	out 90'
	Cakile edentula	1"	1			
	Lathyrus japonicus	5"-3'	10			
	Chamaesyce polygonifolia	<1" - 3"	16			
	Amaranthus pumilus	.75"-1.5"	3			
P5	*Ammophila breviligulata*	1-3"	62	N40 39.885'	W73 03.742'	
P6	*Cakile edentula*	1"- 2'	3	N40 39.945'	W73 03.527'	
P7	*Ammophila breviligulata*	<1-4"	30	N40 39.998'	W73 03.318'	out 30'

August 19, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
P1	*Ammophila breviligulata*	1-8"	27	N40 39.684'	W73 04.611'	out 20'
	Chamaesyce polygonifolia	1/2 - 6"	18			out 10'
P2	*Ammophila breviligulata*	1-10"	56	N40 39.738'	W73 04.396'	out 40'
	Chamaesyce polygonifolia	5"	1			out 25'
P3	*Ammophila breviligulata*	1-6"	115	N40 39.795'	W73 04.159'	out 100', starts 30' out
	Artemisia stelleriana	2-7"	2			out 20'
	Cakile edentula	6"	1			out 25'
	Chamaesyce polygonifolia	1-6"	94			out 100'
P4	*Ammophila breviligulata*	1-6"	102	N40 39.845'	W73 03.951'	out 50'
	*Amaranthus pumilus**	1/4-1/2"	4			out 15'
	Chamaesyce polygonifolia	1-4"	31			out 15'
	Lathyrus japonicus	5"-3'	11			out 25'
P5	*Ammophila breviligulata*	1-6"	96	N40 39.885'	W73 03.742'	out 50'
P6	*Ammophila breviligulata*	<1"	1	N40 39.945'	W73 03.527'	
	Cakile edentula	12"	1			
	Chamaesyce polygonifolia	8", 6"	2			
	Lathyrus japonicus	2"	1			
P7	*Ammophila breviligulata*	<1-4"	33-35	N40 39.998'	W73 03.318'	out 30'

September 14, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
P1	*Ammophilia breviligulata*	1"-7"	34	N40 39.684'	W73 04.611'	out 25' from toe of dune
	Chamaesyce polygonifolia	1/4" - 6"	13			at toe of dune out to 5'
P2	*Ammophilia breviligulata*	1"-4"	55	N40 39.738'	W73 04.396'	out 30' from fencing
P3	*Ammophilia breviligulata*	1"-6", <4"	170	N40 39.795'	W73 04.159'	Starts 30' from fence and extends to 100'
	Chamaesyce polygonifolia	<1"-6"	96			out 90' from fencing
	Polygonum glaucum	3"-6"	3			out 30' from fencing
P4	*Ammophilia breviligulata*	3", 6"	92	N40 39.845'	W73 03.951'	out 60' from fencing
	Chamaesyce polygonifolia	1"-2"	7			out 15' from fencing
	Lathyrus japonicus	6" - 3'	6			out 30' from fencing
P5	*Ammophilia breviligulata*	1", 2" - 4"	67	N40 39.885'	W73 03.742'	out 40' from fencing
P6	No living vegetation			N40 39.945'	W73 03.527'	
P7 (C)	*Ammophilia breviligulata*	<1" - 4"	43	N40 39.998'	W73 03.318'	out 20' from fencing

October 24, 2005

Transect	Species	Size	# Individuals	Latitude	Longitude	Location (out from dune, etc.)
P1	*Ammophilia breviligulata*	1"-5"	12	N40 39.684'	W73 04.611'	out 20' from fencing
P2	*Ammophilia breviligulata*	3"-6"	20	N40 39.738'	W73 04.396'	out 25'
P3	*Ammophilia breviligulata*	<1"-4"	105	N40 39.795'	W73 04.159'	Between primary and 2nd dune out to 50'
P4	*Ammophilia breviligulata*	1"-3"	7	N40 39.845'	W73 03.951'	out 5' from toe
P5	*Ammophilia breviligulata*	2"-3"	4	N40 39.885'	W73 03.742'	toe of dune
P6	No living vegetation		0	N40 39.945'	W73 03.527'	
P7	No living vegetation		0	N40 39.998'	W73 03.318'	

Appendix C—Invertebrate Surveys

Sub-Appendix C-1 Spring Invertebrate Survey Results

Western Fire Island

Date: **19-Jul-05**
Location: **Saltaire**
Sample ID: **Surf Core**

Taxa	**Number**	**% Occurrence**	**Weight**	**% Weight**
Nematoda				
Unidentified Nematode A	2	11.76	0.0005	33.33
Unidentified Nematode B	13	76.47	0.0005	33.33
Annelida				
Spionidae				
Scolelepis squamata				
Oligochaeta				
Unidentified Oligochaetes	2	11.76	0.0005	33.33
Total	17	100	0.0015	100

Date: 19-Jul-05
Location: Saltaire
Sample ID: Mid Tide Core

Taxa	**Number**	**% Occurrence**	**Weight**	**% Weight**
Nematoda				
Unidentified Nematode A	1	50	0.0005	50
Unidentified Nematode B				
Oligochaeta				
Unidentified Oligochaetes	1	50	0.0005	50
Total	2	100	0.001	100

Date: 19-Jul-05
Location: Saltaire
Sample ID: High Tide Core

Taxa	**Number**	**% Occurrence**	**Weight**	**% Weight**
Nematoda				
Unidentified Nematode A	2	11.11	0.0005	33.33
Unidentified Nematode B				
Annelida				
Oligochaeta				
Unidentified Oligochaetes	16	88.89	0.001	66.67
Total	18	100	0.0015	100

Date: 20-Jul-05
Location: Saltaire
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	2	10.00	0.0005	33.33
Unidentified Nematode B				
Oligochaeta				
Unidentified Oligochaetes	18	90.00	0.001	66.67
Total	20	100.00	0.0015	100.00

Date: 20-Jul-05
Location: Saltaire
Sample ID: Wrack Sight Sample

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Crustacea				
Decapoda				
Hippidae				
Emerita talpoida	1	100	0.27	100
Total	1	100	0.27	100

Date: 20-Jul-05
Location: Saltaire
Sample ID: Wrack Pit

Taxa	Number	% Occurrence	Weight	% Weight
Total	Sample Cup Lost			

Date: 20-Jul-05
Location: Saltaire
Sample ID: Supratide Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Culicidae				
Aedes spp.	1	11.11	0.0005	11.11
Canaceidae	8	88.89	0.004	88.89
Total	9	100	0.0045	100

Date: 20-Jul-05
Location: Saltaire
Sample ID: Beachgrass Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Homoptera				
Cicadellidae	1	25.00	0.0005	20.00
Diptera				
Canaceidae	1	25.00	0.001	40.00
Hymenoptera				
Chalcidoidea	1	25.00	0.0005	20.00
Formicidae	1	25.00	0.0005	20.00
Total	4	100	0.0025	100

Fire Island Pines

Date: 21-Jul-05
Location: Fire Island Pines
Sample ID: Surf Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	19	90.48	0.0005	0.50
Unidentified Nematode B	1	4.76	0.0005	0.50
Arthropoda				
Crustacea				
Decapoda				
Hippidae				
Emerita talpoida	1	4.76	0.099	99.00
Total	21	100	0.1000	100

Date: 21-Jul-05
Location: Fire Island Pines
Sample ID: Mid Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	3	75.00	0.0005	50.00
Unidentified Nematode B	1	25.00	0.0005	50.00
Total	4	100	0.001	100

Date: 21-Jul-05
Location: Fire Island Pines
Sample ID: High Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A				
Unidentified Nematode B	2	100.00	0.0005	100.00
Total	2	100	0.0005	100

Date: 22-Jul-05
Location: Fire Island Pines
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Culicidae				
Aedes spp.	1	100.00	0.0005	100.00
Total	1	100	0.0005	100

Date: 22-Jul-05
Location: Fire Island Pines
Sample ID: Wrack Sight Sample

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Crustacea				
Decapoda				
Hippidae				
Emerita talpoida	1 - Dead			
Total	Nothing live in Sample			

Date: 22-Jul-05
Location: Fire Island Pines
Sample ID: Wrack Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	7	100.00	0.0005	100.00
Total	7	100	0.0005	100

Date: 22-Jul-05
Location: Fire Island Pines
Sample ID: Supratide Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Canaceidae	1	14.29	0.001	0.57
Simuliidae				
Simulium spp.	1	14.29	0.0005	0.28
Crustacea				
Amphipoda				
Talitridae				
Americorchestia longicornis	5	71.43	0.175	99.15
Total	7	100	0.1765	100

Date: 22-Jul-05
Location: Fire Island Pines
Sample ID: Beachgrass Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Canaceidae	1	16.67	0.001	0.29
Simuliidae				
Simulium spp.	3	50.00	0.001	0.29
Crustacea				
Amphipoda				
Talitridae				
Americorchestia longicornis	2	33.33	0.338	99.41
Total	6	100	0.34	100

Sub-Appendix C-2 Fall Invertebrate Survey Results

Western Fire Island

Date: 17-Oct-05
Location: Saltaire
Sample ID: Surf Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	4	20.00	0.0005	33.33
Unidentified Nematode B	15	75.00	0.0005	33.33
Oligochaeta				
Unidentified Oligochaetes	1	5.00	0.0005	33.33
Total	20	100	0.0015	100

Date: 17-Oct-05
Location: Saltaire
Sample ID: Mid Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	9	90.00	0.0005	7.69
Arthropoda				
Crustacea				
Decapoda				
Hippidae				
Emerita talpoida	1	10.00	0.006	92.31
Total	10	100	0.0065	100

Date: 17-Oct-05
Location: Saltaire
Sample ID: High Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Total	Nothing in Sample			

Date: 18-Oct-05
Location: Saltaire
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
Total	Nothing In Sample			

Date: 18-Oct-05
Location: Saltaire
Sample ID: Wrack Sight

Taxa	Number	%	Weight	% Weight

	Occurrence
Total	Nothing in Sample

Date: 18-Oct-05
Location: Saltaire
Sample ID: Wrack Pit

Taxa	Number	% Occurrence	Weight	% Weight
Total	Nothing in Sample			

Date: 18-Oct-05
Location: Saltaire Supratide
Sample ID: Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Coleoptera				
Staphylinidae	1	33.33	0.003	40.00
Diptera				
Muscidae	1	33.33	0.004	53.33
Hymenoptera				
Proctortrupoidea	1	33.33	0.0005	6.67
Total	3	100	0.0075	100

Date: 18-Oct-05
Location: Saltaire Beachgrass
Sample ID: Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Unidentified Insect Larvae	1	4.17	0.0005	1.28
Collembola				
Anurida maritima	1	4.17	0.0005	1.28
Coleoptera				
Chrysomelidae	2	8.33	0.003	7.69
Notoxidae				
Notoxus spp	12	50.00	0.007	17.95
Diptera				
Ephydridae	2	8.33	0.001	2.56
Muscidae	5	20.83	0.026	66.67
Hymenoptera				
Formicidae	1	4.17	0.001	2.56
Total	24	100	0.039	100

Fire Island Pines

Date: 27-Oct-05
Location: Fire Island Pines
Sample ID: Surf Core

Taxa	Number	% Occurrence	Weight	% Weight
Annelida				
Spionidae				
Scolelepis squamata	1	50.00	0.012	44.44
Arthropoda				
Crustacea				
Decapoda				
Hippidae				
Emerita talpoida	1	50.00	0.015	55.56
Total	2	100	0.027	100

Date: 27-Oct-05
Location: Fire Island Pines
Sample ID: Mid Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Total	Nothing in Sample			

Date: 27-Oct-05
Location: Fire Island Pines
Sample ID: High Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Total	Nothing in Sample			

Date: 28-Oct-05
Location: Fire Island Pines
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	1	100.00	0.0005	100.00
Total	1	100	0.0005	100

Date: 28-Oct-05
Location: Fire Island Pines
Sample ID: Wrack Sight

Taxa	Number	% Occurrence	Weight	% Weight
Total	Nothing in Sample			

Date: 28-Oct-05
Location: Fire Island Pines
Sample ID: Wrack Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Muscidae	1	100.00	0.006	100.00
Total	1	100	0.006	100

Date: 28-Oct-05
Location: Fire Island Pines
Sample ID: Supratide Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Hymenoptera				
Formicidae	1	100.00	0.001	100.00
Total	1	100	0.001	100

Date: 28-Oct-05
Location: Fire Island Pines Beachgrass
Sample ID: Pit

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Coleoptera				
Chrysomelidae	3	75.00	0.005	83.33
Homoptera				
Cicadellidae	1	25.00	0.001	16.67
Total	4	100	0.006	100

Western Fire Island and Fire Island Pines Beach Nourishment Project

2004 Environmental Monitoring Report

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Date of Completion: January 12, 2005

Introduction

Following the Fall 2003/Winter 2004 beach nourishment projects at Fire Island, monitoring was conducted to assess the recovery of flora and fauna inhabiting the beaches. Surveys were conducted for birds and wildlife, including the endangered Piping plover (*Charadrius melodus*) and Least tern (*Sterna antillarum*). Recovery of vegetation and invertebrates in beach areas was also recorded, including specific observations of Seabeach amaranth (*Amaranthus pumilus*), another endangered species. This report summarizes the results of all surveys, for analysis by Fire Island National Seashore (National Parks Service).

Methodology

Piping Plover/Least Tern Fencing and Monitoring

Fence Installation

Symbolic fencing was installed in areas designated at a site meeting in February 2004, between members of Fire Island National Seashore, U.S. Fish & Widlife Service, The Nature Conservancy and Land Use Ecological Services. Appendix A shows the location of symbolic fencing in the western Fire Island communities and Fire Island Pines.

Materials used to install fencing were: 2" x 2" x 6' untreated wood posts (860), natural twine (12 rolls), flags (12 rolls), "Do Not Enter" Signs (350). Posts were spaced twenty-five feet (25') apart, connected by natural twine. Flags were placed every 8-10 feet apart, with 3-5 flags per section of twine. Signs were then placed on every third post, concentrated to every other post or every post around walkways and high traffic areas.

Monitoring

Monitoring for the entire project area was conducted three days per week at varying times and tides. The area was surveyed thoroughly using binoculars when necessary. On each visit, a Daily Site Visit Form was completed, including a GPS position of any endangered Piping plovers or Least terns. Bird data was entered into a database and plotted in ArcGIS, to obtain a map with positions of birds found. This map and supporting database information were forwarded to NPS as needed.

Vegetation Surveys

Vegetation surveys were conducted once per month throughout the project area, weather permitting. Vegetation was inventoried utilizing the transect method. Transects were established along existing section lines, approximately 900-1,100 feet apart. Species identification, abundance and density were inventoried out five feet (5') to the west and five feet (5') to the east of each transect line, for a total transect width of ten feet (10').

Vegetation was photographed and a GPS position of any threatened or endangered species, especially Seabeach amaranth (*Amaranthus pumilus*), was recorded. The GPS position(s) of threatened/endangered species were plotted on the ArcGIS map

of the project area, and submitted to NPS. Vegetation cover/density was also recorded using GPS, and entered into the ArcGIS map of the project area.

Invertebrate Surveys

Invertebrate surveys were conducted twice per year to determine species diversity and biomass, to statistically compare nourished and reference sites.

Sample Sites

There were two sample sites within the project areas. In the western communities, sampling was done south of Crest Walk (SFD11). In Fire Island Pines, sampling was done south of Harbor Walk (FIP7).

For control sites, data from the U.S. Army Corps of Engineers Placement Area Invertebrate Sampling for the Reformulation Study will be utilized. Data will be available from the Army Corps in November/December 2004.

Sampling Methodology

Sampling methods were taken from the U.S. Army Corps of Engineers Placement Area Invertebrate Sampling for the Reformulation Study.

Samples were taken using a transect method twice each year (spring and fall). Each transect ran from the base of the foredune to the edge of the swash zone. Physical characteristics were noted for each sample site. Each site required two days of sampling.

Core Samples

Core samples were used to catch burrowing animals. To collect the sample, a 3" diameter, 8" long plastic corer was used. The samples were then sieved through a 0.5 mm stainless sieve and organisms identified where possible. Any organisms not identified were bottled and preserved in formalin for later analysis.

On day one, core samples were taken from each site at the following locations along the transect line: (1) at the most recent high tide line (regardless of the presence of wrack), (2) at the low tide surf zone, and (3) in the middle of the tide lines. On day two, one core sample from the wrack line was taken following the sight sample, where insecticide was used to stun organisms.

Sight Samples

Sight samples were taken within the wrackline on day two. One sight sample was taken along each transect. To sample, a quadrat was placed over the wrack to designate the sampling area. A rectangular sieve was then placed over the quadrat, and a light, steady mist of insecticide was sprayed through the sieve mesh onto the wrack. The sieve was then removed and the wrack searched for five minutes for organisms. Organisms that were not identified in the field were bottled and preserved with formalin for later analysis. If the wrack was too thick to sort thoroughly within the allotted five minute period, the bucket-floatation method was used. With this method, the wrack sample is submerged in a white bucket of seawater to catch organisms that float to the surface.

Pitfall Trap Sampling

Pitfall traps were set within the wrackline (1), supratidal (1) and beach grass areas (1) of each transect line for 24 hours. The traps consisted of 0.5 L (16 oz.) plastic solo or comparable cups buried level with the sand surface and partially filled with soapy water. After the sampling period, the contents within each trap were placed in Ziploc bags or comparable containers and placed in a cooler for analysis in the lab.

The methods described above yielded eight (8) samples from each transect line in the spring, and another eight (8) samples in the fall, for a total of sixteen (16) samples per year for each transect.

Data Analysis

Organisms were identified in the field where possible. Any organisms not identified in the field were preserved in formalin and transported to the lab for analysis. The organisms were picked, sorted and identified to the lowest practical taxa.

Results

Piping Plover/Least Tern Monitoring

Western Fire Island

Monitoring was conducted from April 2nd through July 1st. Surveys were performed three times per week during fair weather, in morning and afternoon hours at varying tides. There were neither Piping plovers nor Least terns observed during the monitoring period in this project area. However, other species observed within the fenced area and throughout the project site included Common terns, Herring gulls, Crow (tracks), pigeons, deer, dogs (loose and leashed), cats (loose), one toad and people. Table 1 outlines the monitoring efforts and results in western Fire Island.

One June 28th, a Common tern was observed in an injured state on the beach in Lonelyville. The tern was captured and taken to the following wildlife rehabilitator: Mr. Richard Disenti, 656 Hyman Avenue, Bayshore, telephone 631-422-3906. After a veterinarian examination, it was determined that a gunshot was the cause of injury. The bird remained at the rehabilitator for treatment.

Table 1. Monitoring results in the communities of Saltaire, Fair Harbor, Dunewood and Lonelyville (Western Fire Island). * = tide between low and high

	Date	Time	Tide	Species Observed	Comments
April	4/2	10:00am	Low	Deer	
	4/5	10:00am	Mid*	Dog (3 loose)	
	4/7	2:30pm	Low		
	4/9	12:00pm	High		
	4/12	10:00am	Low	Herring gull, cat	
	4/15	1:30pm	Low	Dog	Storm surge into fenced area
	4/19	11:30am	Mid	Crow tracks	
	4/21	1:15pm	Mid	Dog (loose)	
	4/23	9:00am	High	Pigeon	
	4/27	9:15am	Low	Dog (leashed), Herring gull	
	4/28	2:00pm	High	Herring gull	
	4/30	9:30am	Low	Herring gull	
May	5/4	1:30pm	Low	Herring gull	
	5/6	10:00am	High	Herring gull	
	5/7	2:00pm	Mid	Dog (loose), Herring gull	
	5/10	11:00am	Mid	Dog (loose)	
	5/12	2:30pm	High	Herring gull	
	5/14	11:00am	Low	Dog (leashed)	Major fence repairs made
	5/17	11:00am	Mid	Herring gull	Re-installed ~400ft fence
	5/19	10:00am	High		Beach grass within fencing
	5/20	2:00pm	Low	Herring gull, pigeon	
	5/24	9:00am	Mid	Herring gull	
	5/25	11:00am	High		
	5/27	3:00pm	High	Herring gull (2-flying)	
June	6/1	10:00am	Mid	Dog (loose), Herring gulls	Major fence repairs
	6/2	11:00am	Mid		
	6/4	10:00am	High	Herring gull, dog (loose), pigeon	Vehicle through fencing eastern Lonelyville
	6/7	9:30am	Mid	Herring gull, pigeon, crow	Scarp along entire project length (2' to 5' in height)
	6/9	2:00pm	High	Crow, dog (3-loose)	
	6/11	11:30am	Mid	Herring gull	
	6/14	10:00am	Low	Herring gull, deer, dog (1-loose, 1-leashed)	
	6/15	11:00am	Low	Herring gull, toad	
	6/18	12:00pm	Mid		
	6/21	12:30pm	Mid	Dog (loose)	
	6/23	2:00pm	Mid	Herring gull	
	6/25	10:30am	Mid	Crow, dog (leashed)	
	6/28	10:30am	Low	Herring gull, Common tern	C.tern injured, taken to rehab
July	7/1	10:00am	Mid	Common tern, herring gull, pigeon, crow	Removed twine, flagging, posts remained

Fire Island Pines

Monitoring for Fire Island Pines was conducted from April 2nd through July 20th. Please refer to Table 2 for an outline of monitoring efforts and results in Fire Island Pines. Species observed during the monitoring period included Crows, Herring gulls, Common terns, Drake mallards, pigeons, dogs (loose and leashed), deer, fox tracks, and

people. In addition, two Least terns were observed on May 19th between Atlantic Walk and Harbor Walk. The birds were resting, and no nesting or breeding activity was seen.

There were no Piping plovers observed in the area from April 2nd through June 16th. However, on June 17th, a breeding pair of birds was discovered approximately 450 feet east of Nautilus Walk (Figure 1b). The pair had formed a nest and one egg was laid. On June 18th, there were two eggs observed in the nest (Figure 1a), but no eggs were laid after that date. The clutch was therefore considered complete on June 18th, which gave an estimated hatch date of July 15th and fledge date of August 9th.

Although there were several crows in the vicinity of the plover nest, the eggs did hatch on July 15th. Two plover chicks were observed in the area of the nest, moving around with the adults, on that date. By July 19th, the plover family had moved east of the community, in the vacant area just west of the driving cut. Both adults and both chicks were observed at that time. On July 20th, no birds were observed in the project area. Personnel from Fire Island National Seashore observed the birds approximately three hundred yards east of the driving cut. The birds were then officially transferred to Fire Island National Seashore for continued monitoring. It was later learned that no chicks were observed to fledge, and therefore the nest was considered failed.

Figure 1. (a) Fire Island Pines Piping plover nest with eggs. (b) Fire Island Pines adult plover.

Table 2. Monitoring results in the community of Fire Island Pines. * = tide between low and high

	Date	Time	Tide	Species Observed	Comments
April	4/2	1:20pm	Mid*	Crow, fox tracks	East section eroded severely
	4/6	10:00am	High	Crows	
	4/7	12:00pm	Mid	Dog (loose)	
	4/9	9:30am	High	Dog (loose)	
	4/11	2:00pm	High	Crows, dog (leashed)	
	4/15	5:00pm	High		
	4/18	3:00pm	Low		
	4/20	1:00pm	Low	Crow	
	4/22	5:00pm	Low		
	4/24	1:30pm	Mid		
	4/25	8:00am	Mid		
	4/27	1:00pm	High	Crow, pigeon	
	4/29	11:00am	Low		
May	5/2	8:30am	Mid		
	5/4	1:00pm	Low		
	5/8	8:00am	Mid	Crows	
	5/9	6:30am	Low		
	5/11	3:30pm	High	Crow, Herring gulls	
	5/13	6:30pm	Mid		
	5/14	6:30am	Mid		
	5/15	6:30am	High		
	5/16	6:30pm	High		
	5/17	2:00pm	Low		
	5/19	12:00pm	Mid	Least terns, Common terns, Drake mallard	
	5/23	6:30pm	Mid		
	5/24	11:00am	High	Herring gull, Common tern	
	5/28	6:30pm	Mid		
	5/31	2:30pm	Mid		
June	6/3	1:00pm	Mid	Dog (leashed)	
	6/5	6:30pm	Mid	Herring gull, Dog (leashed)	
	6/6	6:45pm	Low	Herring gull	
	6/8	12:30pm	High	Crow	
	6/11	10:30am	Low	Herring gull	
	6/13	6:00pm	High		
	6/16	11:00am	Mid	Herring gulls, Dog (loose)	
	6/17	11:00am	Mid	Piping plover pair and nest w/1 egg, crows near nest	
	6/18	10:00am	High	Plover nest 2 eggs	
	6/21	11:00am	High	Plover adults	
	6/22	9:00am	Mid	Plover adults	
	6/25	12:00pm	High	Plover adults	
	6/28	2:00pm	Mid	Crow	
	6/29	11:00am	Low	Crow, Common terns	
	6/30	1:00pm	Low	Common terns, crows near plover nest	

Table 2 cont'd.

July	7/6	11:45am	High	Common terns	
	7/8	10:00am	Mid	Plover adults	
	7/9	1:30pm	High	Plover adults	
	7/13	3:00pm	Mid	Plover adults	
	7/14	2:00pm	Mid	Plover adults	
	7/15	4:00pm	Mid	Plover nest hatched—2 chicks observed, Common terns	Adults & chicks off nest, moving around
	7/19	12:00pm	Mid	Plovers, Crow	Plover adults, chicks moved east to vacant area west of cut
	7/20	11:00am	High		No birds—plovers out of FIP

Vegetation Surveys

Western Fire Island

Vegetation surveys were conducted in western Fire Island communities on June 28, July 30, September 3, September 29, and October 25. There were seven transects established within the renourishment area, and one control transect west of the renourishment area (Figure 2, Table 3).

Table 3. Transects for western Fire Island vegetation surveys.

ID	CPE Map Location	Descriptive Location	Lat	Long
W-1	SFD4	south of Beach Walk	N40 38.073'	W73 11.856'
W-2	SFD7	south of Navy Walk	N40 38.125'	W73 11.647'
W-3	SFD8	south of Pennant Walk	N40 38.164'	W73 11.498
W-4	F16	south of Broadway (border of Saltaire/Fair Harbor)	N40 38.221'	W73 11.272
W-5	SFD15	south of Pine Walk	N40 38.275'	W73 11.054'
W-6	F18	south of Sandpiper Walk	N40 38.330'	W73 10.763'
W-7	SFD21	eastern border of fencing	N40 38.408'	W73 10.456'
C-1	control	west of western project boundary	N40 38.051'	W73 11.974'

Vegetation was observed in all surveys to varying degrees. Species observed included *Ammophila breviligulata* (Beach grass), *Lathyrus japonicus* (Beach pea), *Chamaesyce polygonifolia* (Seaside spurge), *Polygonum glaucum* (Seaside knotweed), *Artemisia steleriana* (Dusty miller), and *Amaranthus pumilus* (Seaside amaranth). Appendix B-1 outlines the survey results for each date.

To analyze whether the vegetative growth was significantly different in renourished areas versus control areas, a Model I ANOVA test was run. The test compared the quantity of *Ammophila breviligulata* in each transect and each control. Please note that both controls were used, as the WC1 control had no fencing, while the PC1 control had symbolic fencing similar to the renourished areas. Table 4 (below) shows the results of the ANOVA test.

Table 4. ANOVA table for quantity of *Ammophila breviligulata*.

	df	SS	MS	F_s
Y_{bar}-Y_{2bar}	8	2308	288.6	8.551 (P<.001)
Y-Y_{bar}	36	1215	33.74	
Y-Y_{2bar}	44	3523		

Source of Variation	df	SS	MS	Fs
Among groups (renourished areas)	8	2308	288.6	
Renourished vs. WC1	6	309.2	51.54	1.527 *ns*
Renourished vs. PC1	6	335	55.84	1.655 *ns*

The results of the ANOVA test show that, although there is significant variation with respect to quantity of *Ammophila breviligulata*, the variation is not due to the "treatment" of beach renourishment.

In addition to vegetation transects, Seabeach amaranth was recorded throughout the western Fire Island project area. Twenty four (24) individuals were recorded throughout the observation period. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Areas were Seabeach amaranth were recorded were fenced off for protection of the endangered plant. Figure 2 and Table 5 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 2. Vegetation transect locations and Seabeach amaranth observed locations in the western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

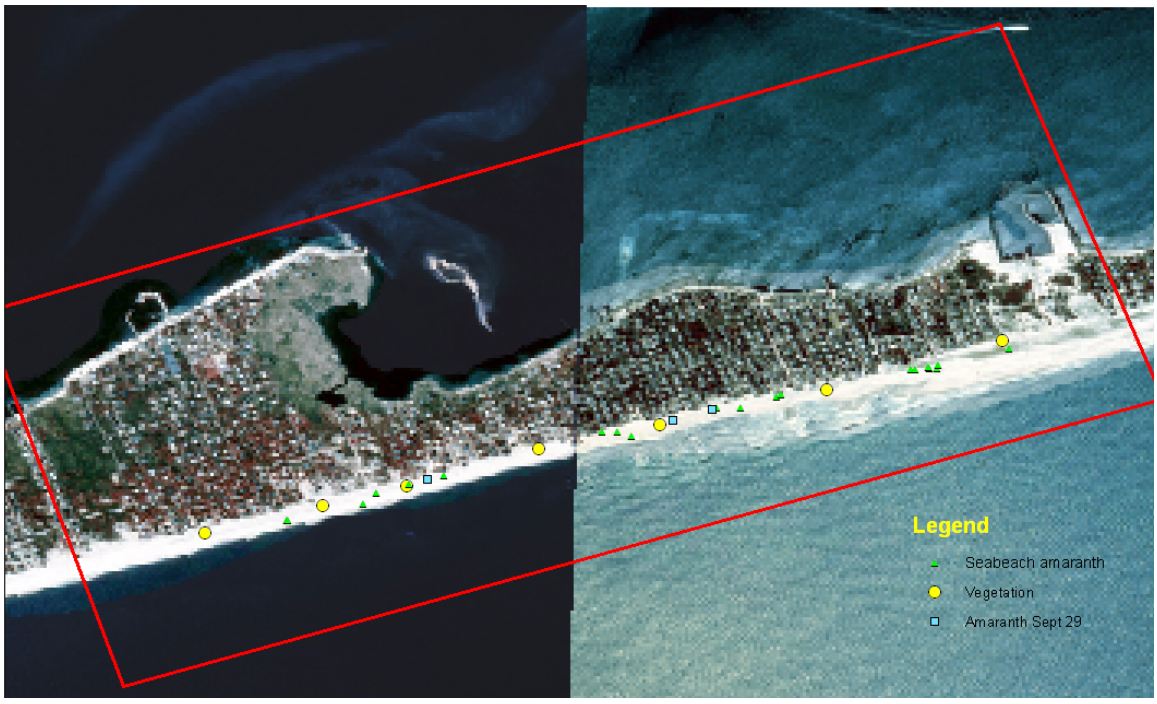

Table 5. Observations of Seabeach amaranth in western Fire Island communities of Saltaire, Fair Harbor, Dunewood and Lonelyville.

Latitutde	Longitude	Location	Size	# Invididuals	Symbolic Fencing
N40 38.104	W73 11.709	(NPS identified)		2	
N40 38.373	W73 10.584	(NPS identified)		2	
N40 38.131	W73 11.564	(NPS identified)		1	
N40 38.139	W73 11.553	~40' east of Beacon Walk, ~40' off dune	1", 1"	2	Beacon Walk-75' east, 50' off dune
N40 38.159	W73 11.497	~15' west of W-3 transect, ~20' off dune	3"	1	300-375' east of Beacon Walk, out 50'
N40 38.172	W73 11.433	~200' east of transect W-3 *or* ~360' west of Sea Walk, ~30' off dune	1.25"	1	325-400' west of Sea Walk, ~75' off dune
N40 38.225	W73 11.156	~50' east of Birch Walk at the toe of the dune	1.75"	1	Birch Walk--Cranberry Walk, 30' out
N40 38.255	W73 11.129	~25' and ~40' west of Cranberry Walk, both ~10' off dune	1.75", 2", 2"	3	
N40 38.273	W73 11.033	~100' west of Oak Walk, 45' off dune	2.25"	1	75-125' west of Oak Walk, 75' out
N40 38.292	W73 10.964	~20' east of Holly Walk, ~20' off dune	4"	1	100' west of 5th Ave--Holly Walk, 50' out
N40 38.294	W73 10.957	~115' west of 5th Ave., ~20' off dune	2.75"	1	
N40 38.303	W73 10.914	~75' east of 5th Ave., ~20' off dune	1"	1	50-100' east of 5th Ave., 35' out
N40 38.318	W73 10.852	~30' east of Spruce Walk, ~15' off dune	1.5"	1	Walnut Walk--100' east, 50' out
N40 38.318	W73 10.843	~75' east of Spruce Walk, ~20' off dune	2"	1	
N40 38.360	W73 10.618	~70' east of Plank Rd., ~35' off dune	2"	1	50-100' east of Plank Rd., 75' out
N40 38.370	W73 10.609	(NPS identified)		1	
N40 38.374	W73 10.570	(NPS identified)		1	
N40 38.380	W73 10.568	(NPS identified)		1	
N40 38.405	W73 10.444	(NPS identified)		1	

Fire Island Pines

Vegetation transect surveys were conducted in Fire Island Pines on June 29, July 29, September 3, October 4 and October 26. Six transects were established within the renourishment area, with one control transect east of the eastern project boundary (Figure 3, Table 6).

Table 6. Transect locations for Fire Island Pines.

ID	CPE Map Location	Descriptive Location	Lat	Long
P-1	FIP2	~ 150' east of western fencing boundary	N40 39.684'	W73 04.611'
P-2	FIP4	south of Coast Guard Walk	N40 39.738'	W73 04.396'
P-3	F40	south of Widgeon Walk	N40 39.795'	W73 04.159'
P-4	FIP8	south of Neptune Walk	N40 39.845'	W73 03.951'
P-5	FIP10	south of Shell Walk	N40 39.885'	W73 03.742'
P-6	FIP12	~150' west of Fishermans Walk	N40 39.945'	W73 03.527'
P-7	FIP14	~225' east of Sail Walk	N40 39.998'	W73 03.348'

Vegetation was observed in all surveys to varying degrees. Species observed included *Ammophila breviligulata* (Beach grass), *Lathyrus japonicus* (Beach pea), *Chamaesyce polygonifolia* (Seaside spurge), *Polygonum glaucum* (Seaside knotweed), *Artemisia steleriana* (Dusty miller), *Salsola kali* (Russian thistle) and *Amaranthus pumilus* (Seaside amaranth). Appendix B-2 outlines the survey results for each date.

As with the Western Fire Island project area, analysis on whether the vegetative growth was significantly different in renourished areas versus control areas was performed for the Fire Island Pines project area. A Model I ANOVA test was run to compare the quantity of *Ammophila breviligulata* in each transect and each control. Please note that both controls were used, as the WC1 control had no fencing, while the PC1 control had symbolic fencing similar to the renourished areas. Table 7 (below) shows the results of the ANOVA test.

Table 7. ANOVA table for quantity of *Ammophila breviligulata*.

	df	SS	MS	F_s
Y_{bar}-Y_{2bar}	8	59422	7427.8	5.732 (P<.001)
Y-Y_{bar}	36	46653	1295.9	
Y-Y_{2bar}	44	106075		

Source of Variation	df	SS	MS	Fs
Among groups (renourished areas)	8	59422	7427.8	
Renourished vs. WC1	5	9849.5	1969.9	1.520 *ns*
Renourished vs. PC1	5	9983.1	1996.6	1.541 *ns*

Again, the results of the ANOVA test show that, although there is significant variation with respect to quantity of *Ammophila breviligulata*, the variation is not due to the "treatment" of beach renourishment.

In addition to vegetation transects, Seabeach amaranth was recorded throughout Fire Island Pines. A total of forty five (45) plants were observed. Individuals were located with a GPS unit, and size and a descriptive location were recorded. Areas where Seabeach amaranth were recorded were fenced off for protection of the endangered plant. Figure 3 and Table 8 outline the locations of Seabeach amaranth throughout the western Fire Island project area.

Figure 3. Vegetation transect locations and Seabeach amaranth observed locations in Fire Island Pines.

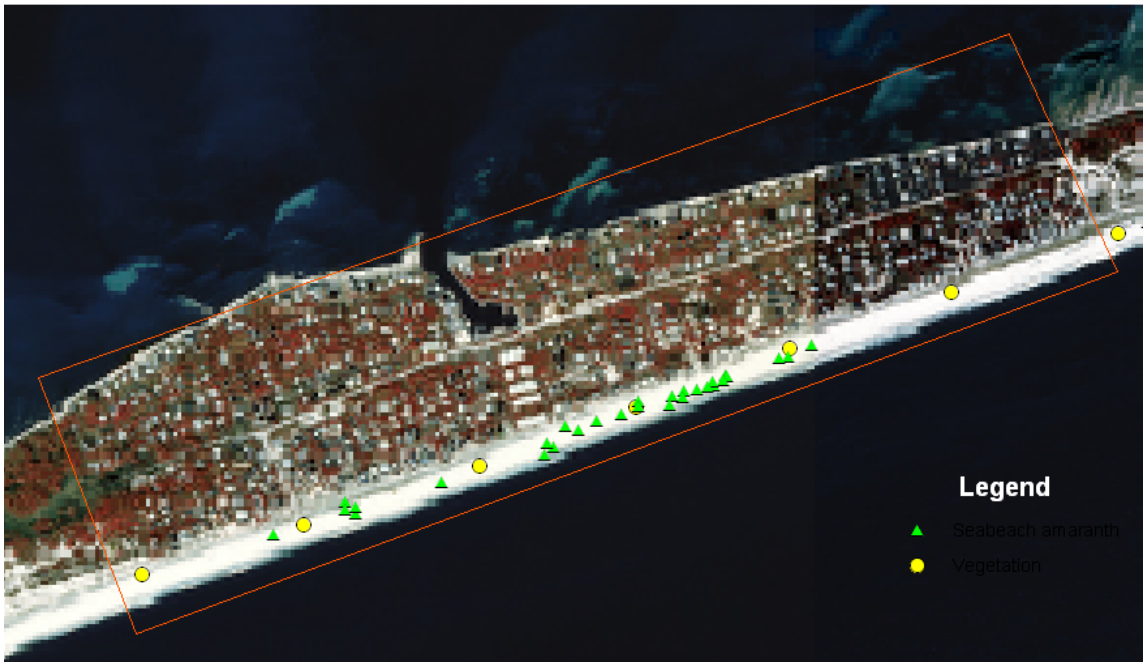

Table 8. Observations of Seabeach amaranth in Fire Island Pines.

Latitutde	Longitude	Location	Size	# Plants	Symbolic Fencing
N40 39.723	W73 04.436	50' west of western boundary Coast Guard Walk cut, out 25'	1"	1	fencing west of Coast Guard Walk cut to Driftwood Walk remains unchanged
N40 39.746	W73 04.340	50' east Beacon Walk, 40' off	5"	1	Beach Hill Walk--175' east, out same distance
N40 39.754	W73 04.340	75' east of Beach Hill Walk, 25' out	0.75"	1	
N40 39.742	W73 04.333	25-40' east of Beach Hill Walk, 50-60' out	1",1",1.25"	3	
N40 39.749	W73 04.325	100' east of Beacon Walk, 55' off	3.5"	1	
N40 39.773	W73 04.209	5' west of Cedar Walk, 100' off dune	1"	1	walk adjusted 20' to the east, closed at Cedar--75' west, 140' off
N40 39.776	W73 04.189	75-95' east of Cedar Walk, 100' off dune	.75",1",1"	3	Cedar Walk (as adjusted)--100' east, out 140'
N40 39.809	W73 04.068	65' west Harbor Walk, 45' & 60' off	4", 5"	2	
N40 39.805	W73 04.060	35' west of Harbor Walk, 80' off dune	.75"	1	Harbor Walk -100' west, out 100'
N40 39.824	W73 04.043	40' east Harbor Walk, 25' off	2.5"	1	
N40 39.821	W73 04.026	125-130' east Harbor Walk, 30-60' off	3", 1.5"	2	75-150 east of Harbor Walk, 95' off
N40 39.830	W73 04.001	280' and 310'east of Harbor Walk, 25' out	0.75",1"	2	250'-350' east of Harbor Walk, 100' out
N40 39.837	W73 03.969	270' west of Nautilus Walk, 20' out	0.75"	1	225'-300' west of Nautilus Walk, 75' out
4N0 39.844	W73 03.947	170' west of Nautilus Walk, 20' off	1.25"	1	100-200' west of Nautilus Walk, 75' out
N40 39.849	W73 03.945	120' west of Nautilus Walk, 30' off	0.75"	1	
N40 39.845	W73 03.904	15' east Nautilus, 75' off	3"	1	Nautilus to Ozone (closed for plovers)
N40 39.854	W73 03.902	25' east Nautilus, 30-35' off	4",3"	2	
N40 39.852	W73 03.887	85' east Nautilus, 75' off	1.5"	1	
N40 39.858	W73 03.886	100' east Nautilus, 40' off	3",2"	2	
N40 39.859	W73 03.868	150' east Nautilus, 50' off	7"	1	
N40 39.863	W73 03.854	190' east Nautilus, 40-75' off	4",3.5",2",4"	4	
N40 39.867	W73 03.848	235' east Nautilus, 40' off	3.5"	1	
N40 39.864	W73 03.845	260' east Natilus, 40-65' off	2.5", 5", 5.5"	3	
N40 39.868	W73 03.835	320' east Nautilus, 40' off	3"	1	
N40 39.874	W73 03.828	340' east Nautilus, 25' off	2"	1	
N40 39.872	W73 03.827	325' east Nautilus, 35' off	2.5"	1	
N40 39.890	W73 03.757	225' west Ozone, 25' off	1"	1	
N40 39.891	W73 03.744	160' west Ozone, 25' off	1.5"	1	
N40 39.902	W73 03.713	25' west Ozone Walk, 25' off	4"	1	
N40 40.030	W73 03.245	100' west of Eastern project boundary, 20' off dune	0.5", 1"	2	all fencing east of homes remains unchanged

Invertebrate Surveys

Spring invertebrate surveys were conducted June 14-15 for western Fire Island and June 16-17 for Fire Island Pines. A detailed report of invertebrate survey results for both project locations can be found in Appendix C-1. Sampling locations are found on Figures 1 and 2.

Fall invertebrate samples were collected October 25-26 for western Fire Island and October 26-27 for Fire Island Pines. A detailed report of invertebrate survey results for both project locations can be found in Appedix C-2.

Appendix A—Fencing and Transect Locations

(Symbolic fence and transect plans were submitted as paper documents to FINS in 2004.)

Appendix B—Vegetation Surveys

Vegetation survey results for western Fire Island and Fire Island Pines. Sub-appendix B-1 depicts results for western Fire Island; sub-appendix B-2 has results from Fire Island Pines.

Sub-Appendix B-1 Western Fire Island Vegetation Surveys

Western Fire Island June Vegetation Survey

Conducted June 28, 2004

Transect	Species	Size	# Invididuals	Latitutde	Longitude	Location
W-1	*Ammophila breviligulata*	<2"	2	N40 38.073	W73 11.856	LW* snow fence
	Ammophila breviligulata	<2"	3			SW* snow fence
W-2	*Ammophila breviligulata*	2",2",3"	3	N40 38.125	W73 11.647	LW snow fence
W-3	*Ammophila breviligulata*	<2"	25	N40 38.164	W73 11.498	SW snow fence out ~40'
	Artemisia stelleriana	2.5",7"	2			
	Chamaesyce polygonifolia	5"	1			
W-4	*Ammophila breviligulata*	<2"	1	N40 38.221	W73 11.272	LW snow fence
	Ammophila breviligulata	<1"	1			SW snow fence
W-5	*Ammophila breviligulata*	<1"-4"	20	N40 38.275	W73 11.054	Base of dune out ~40'
	Artemisia stelleriana	3", 4"	2			
	Lathyrus japonicus	<1", 1.5"	2			
W-6	*Ammophila breviligulata*	<2"	9	N40 38.330	W73 10.763	SW snow fence out ~30'
	Artemisia stelleriana	12"	1			
W-7	*Ammophila breviligulata*	2"-2'	1 indiv., 3 clumps	N40 38.408	W73 10.456	LW snow fence
	Ammophila breviligulata	1-3"	25			SW snow fence
	Chamaesyce polygonifolia	3"	1			
	Artemisia stelleriana	3"	1			

Western Fire Island Vegetation Survey

Conducted July 30, 2004

Transect	Species	Size	# Invididuals	Latitutde	Longitude	Location
W-1	*Ammophila breviligulata*	<1" - 5"	3	N40 38.073	W73 11.856	1LW, 2 SW 10' off
	Polygonum glaucum	3", 3"	2			SW* snow fence
W-2	*Ammophila breviligulata*	<1" - 2"	3	N40 38.125	W73 11.647	LW snow fence
	Ammophila breviligulata	1" - 2"	7			SW snow fence out 75'
	Polygonum glaucum	2"	1			
	Chamaesyce polygonifolia	4"	1			
W-3	*Ammophila breviligulata*	<2"	35-40	N40 38.164	W73 11.498	SW snow fence out ~55'
	Artemisia stelleriana	2.5",7"	2			
	Polygonum glaucum	2", 3"	2			
	Amaranthus pumilus	1.5"	1			
	Chamaesyce polygonifolia	12", 14"	2			
W-4	*Ammophila breviligulata*	<2"	8-May	N40 38.221	W73 11.272	LW snow fence
	Polygonum glaucum	2",2"	2			
	Chamaesyce polygonifolia	2",3"	2			
	Chamaesyce polygonifolia	2"	1			SW fence out ~10'
W-5	*Ammophila breviligulata*	<1"-4"	10-Aug	N40 38.275	W73 11.054	LW snow fence
	Artemisia stelleriana	9"	1			
	Chamaesyce polygonifolia	7" (half buried)	1			SW fence out ~50'
W-6	*Ammophila breviligulata*	<2"	22-25	N40 38.330	W73 10.763	LW snow fence
	Chamaesyce polygonifolia	5"	1			
	Mollugo verticillata	1" - 2"	2			
	Artemisia stelleriana	12"	1			SW fence out ~5'
W-7	*Ammophila breviligulata*	<2"	8-10	N40 38.408	W73 10.456	LW snow fence
	Ammophila breviligulata	<1"	5			SW snow fence out ~50'
	Artemisia stelleriana	3.5"	1			

Western Fire Island Vegetation Survey
Conducted September 3, 2004

Transect	Species	Size	# Invididuals	Latitutde	Longitude	Location
W-1	*UNDER WATER*					
W-2	*UNDER WATER*					
W-3	*Ammophila breviligulata*	<1" - 3"	20-25	N40 38N.164	W73 11.498	out 75', but out 30' is under water
	Artemisia stelleriana	4"	1			
W-4	*Ammophila breviligulata*	<2"	7-10	N40 38.221	W73 11.272	LW snow fence
	Polygonum glaucum	3" - 5"	8			
	Chamaesyce polygonifolia	4"	1			
	NO VEG SW OF FENCE (UNDER WATER)					
W-5	*Ammophila breviligulata*	<1"-4"	5	N40 38.275	W73 11.054	LW snow fence
	NO VEG SW OF FENCE (UNDER WATER)					
W-6	*Ammophila breviligulata*	<2"	3-5	N40 38.330	W73 10.763	LW snow fence
	Chamaesyce polygonifolia	3"	1			
	Lathyrus japonicus	5"	1			
	Ammophila breviligulata	<2"	2			SW fence out ~5'
W-7	*Ammophila breviligulata*	<1" - 5"	6	N40 38.408	W73 10.456	LW snow fence
	Ammophila breviligulata	<1"	2			SW snow fence out ~10'
Control	*UNDER WATER*					

Western Fire Island Vegetation Survey
Conducted September 29, 2004

Transect	Species	Size	# Invididuals	Latitutde	Longitude	Location
W-1	*Ammophila breviligulata*	<2"	2	N40 38.073	W73 11.856	SW snow fence out 10'
	Ammophila breviligulata	<1"	1			LW snow fence
W-2	*Ammophila breviligulata*	1-4"	8	N40 38.125	W73 11.647	LW snow fence
W-3	*Ammophila breviligulata*	<1"	2	N40 38.164	W73 11.498	LW snow fence
	Ammophila breviligulata	1-3"	20-22			SW snow fence out 40'
	Chamaesyce polygonifolia	3-5"	3			SW snow fence out 40'
W-4	*Ammophila breviligulata*	1-2"	10-12	N40 38.221	W73 11.272	LW snow fence
	Polygonum glaucum	2-6"	8			
W-5	*Ammophila breviligulata*	1-6"	6	N40 38.275	W73 11.054	LW snow fence
	Artemisia stelleriana	14"	1			
W-6	*Ammophila breviligulata*	<2"	2	N40 38.330	W73 10.763	SW snow fence out 5'
	Ammophila breviligulata	1-4"	6-8			LW snow fence
	Chamaesyce polygonifolia	6"	1			
W-7	*Ammophila breviligulata*	1-3"	7	N40 38.408	W73 10.456	LW snow fence
	Ammophila breviligulata	<1"	1			SW snow fence out 5'
Control	*Ammophila breviligulata*	<2"	3	N40 38.051	W73 11.974	SW snow fence out 20'

Western Fire Island Vegetation Survey
Conducted October 25, 2004

Transect	Species	Size	# Invididuals	Latitutde	Longitude	Location
W-1	*No Vegetation*			N40 38.073	W73 11.856	snow fence 1/2 buried, water line goes half up dune
W-2	*Ammophila breviligulata*	2-4"	7	N40 38.125	W73 11.647	LW of snow fence
W-3	*Ammophila breviligulata*	1-4"	10	N40 38.164	W73 11.498	LW snow fence
	Ammophila breviligulata	2-6"	10			SW fence out 40'
W-4	*No Vegetation*			N40 38.221	W73 11.272	snow fence destroyed, water line up to dune
W-5	*Ammophila breviligulata*	1-6"	6	N40 38.275	W73 11.054	LW snow fence
	Artemisia stelleriana	9"	1			
W-6	*No Vegetation*			N40 38.330	W73 10.763	water line goes to dune
W-7	*Ammophila breviligulata*	1-3"	7	N40 38.408	W73 10.456	LW snow fence
Control	*Ammophila breviligulata*	1-2"	3	N40 38.051	W73 11.974	out 25' from dune

Sub-Appendix B-2 Fire Island Pines Vegetation Surveys

Fire Island Pines Vegetation Survey
Conducted June 29, 2004

Transect	Species	Size	#Plants	Latitutde	Longitude	Location
P-1	*Ammophila breviligulata*	<1"-3"	~50	N40 39.684	W73 04.611	SW snow fence
	Artemisia stelleriana	2.5"	1			
P-2	*Ammophila breviligulata*	<1"-3"	~50	N40 39.738	W73 04.396	SW snow fence out ~40'
	Lathyrus japonicus	<1"-3"	10			
P-3	*Ammophila breviligulata*	1"-1' clump	17	N40 39.795	W73 04.159	SW snow fence
P-4	*Ammophila breviligulata*	3"-5" clumps	15+ clumps	N40 39.845	W73 03.951	LW snow fence
	Ammophila breviligulata	<1"-3"	>100			SW snow fence out 50'
	Lathyrus japonicus	<1"-3"	~50			
	Artemisia stelleriana	2"-4"	3			
	Amaranthus pumilus	1.5"	1			SW of snow fence out ~20'
P-5	NOT SURVEYED DUE TO PLOVER NEST					
P-6	(no vegetation)			N40 39.945	W73 03.527	
P-7	*Ammophila breviligulata*	<1"	1	N40 39.998	W73 03.348	LW snow fence
	Ammophila breviligulata	<1"	4			SW snow fence

Fire Island Pines Vegetation Survey
Conducted July 29, 2004

Transect	Species	Size	#Plants	Latitutde	Longitude	Location
P-1	*Ammophila breviligulata*	<1"-3"	15-18	N40 39.684	W73 04.611	Dune out ~50'
P-2	*Ammophila breviligulata*	<1"-3"	6	N40 39.738	W73 04.396	LW snow fence
	Ammophila breviligulata	<1"-3"	10-12			SW snow fence out ~50'
P-3	*Ammophila breviligulata*	3 - 6"	10-12	N40 39.795	W73 04.159	LW snow fence
	Ammophila breviligulata	<1" - 5"	>200			SW snow fence out ~150'
	Chamaesyce polygonifolia	3" - 8"	7			
	Artemisia stelleriana	3"	1			
	Polygonum glaucum	3" - 10"	3			
P-4	*Ammophila breviligulata*	2" - 6"	22-25	N40 39.845	W73 03.951	LW snow fence
	Ammophila breviligulata	<1" - 4"	>200			SW snow fence out 100'
	Lathyrus japonicus	1" - 8"	17-20			
	Artemisia stelleriana	8" 12"	2			
	Amaranthus pumilus	1.5"	1			SW of snow fence out ~20'
	Salsola kali	4"	1			
P-5	*Ammophila breviligulata*	<1" - 3"	8	N40 39.885	W73 03.742	LW snow fence
	Ammophila breviligulata	<1" - 3"	>50			SW snow fence out ~120'
	Artemisia stelleriana	8"	1			
	Polygonum glaucum	1"	1			
	Lathyrus japonicus	<1" - 7"	7			
P-6	*Ammophila breviligulata*	<1"	1	N40 39.945	W73 03.527	SW snow fence out ~15'
	Ammophila breviligulata	<1" 3"	4			LW snow fence
P-7	*Ammophila breviligulata*	<1"	1	N40 39.998	W73 03.302	SW snow fence out ~25'
	Polygonum glaucum	1"	1			
	Chamaesyce polygonifolia	3", 3"	2			
	Artemisia stelleriana	12"	1			

Fire Island PinesVegetation Survey
Conducted September 3, 2004

Transect	Species	Size	#Plants	Latitutde	Longitude	Location
P-1	*Ammophila breviligulata*	<1"-3"	6	N40 39.684	W73 04.611	LW snow fence
	Chamaesyce polygonifolia	6"	1			
	Polygonum glaucum	3"	1			
P-2	*Ammophila breviligulata*	<1"-3"	4	N40 39.738	W73 04.396	LW snow fence
	Ammophila breviligulata	<1"-3"	8			SW snow fence out ~50'
P-3	*Ammophila breviligulata*	3 - 6"	10	N40 39.795	W73 04.159	LW snow fence
	Ammophila breviligulata	<1" - 5"	>75			SW snow fence out ~100'
	Chamaesyce polygonifolia	1", 3"	2			
	Artemisia stelleriana	3"	1			
	Polygonum glaucum	2", 6"	2			
p-4	*Ammophila breviligulata*	<1" - 4"	>50	N40 39.845	W73 03.951	SW snow fence out 100'
	Lathyrus japonicus	1" - 8"	25-30			
	Artemisia stelleriana	12"	1			
	Chamaesyce polygonifolia	5"	1			
	Salsola kali	4"	1			
P-5	*Ammophila breviligulata*	<1" - 3"	6	N40 39.885	W73 03.742	LW snow fence
	Ammophila breviligulata	<1" - 3"	25-30			SW snow fence out ~50'
	Polygonum glaucum	3"	1			
	Lathyrus japonicus	7", 8"	2			
P-6	*Ammophila breviligulata*	<1"	1	N40 39.945	W73 03.527	SW snow fence out ~15'
P-7	*UNDER WATER*					

Fire Island Pines Vegetation Survey
Conducted October 4, 2004

Transect	Species	Size	#Plants	Latitutde	Longitude	Location
P-1	*Ammophila breviligulata*	1-4"	8	N40 39.684	W73 04.611	SW fence out 20'
	Chamaesyce polygonifolia	4"	1			
P-2	*Ammophila breviligulata*	2-5"	3	N40 39.738	W73 04.396	LW snow fence
	Ammophila breviligulata	1-5"	7			SW snow fence out 15'
P-3	*Ammophila breviligulata*	3 - 6"	15-17	N40 39.795	W73 04.159	LW snow fence
	Ammophila breviligulata	1-3"	>75			SW fence out 50'-150'
	Chamaesyce polygonifolia	2-5"	3			
	Polygonum glaucum	3", 8"	2			
P-4	*Ammophila breviligulata*	1-5"	>60	N40 39.845	W73 03.951	SW snow fence out 100'
	Lathyrus japonicus	1-3"	25-30			
	Chamaesyce polygonifolia	3"	1			
P-5	*Ammophila breviligulata*	1-4"	7	N40 39.885	W73 03.742	LW snow fence
	Ammophila breviligulata	1-3"	>35			SW snow fence out ~50'
	Polygonum glaucum	5"	1			
	Chamaesyce polygonifolia	9"	1			
	Lathyrus japonicus	1", 2"	2			
P-6	(no vegetation)			N40 39.945	W73 03.527	
P-7	*Ammophila breviligulata*	1-1.5"	2	N40 39.998	W73 03.302	LW snow fence

Fire Island Pines Vegetation Survey
Conducted October 26, 2004

Transect	Species	Size	#Plants	Latitutde	Longitude	Location
P-1	*Ammophila breviligulata*	1-6"	8-10	N40 39.684	W73 04.611	out 25' from dune
P-2	*Ammophila breviligulata*	4-6"	4	N40 39.738	W73 04.396	LW snow fence
	Ammophila breviligulata	1-4"	6			SW snow fence out 5'
P-3	*Ammophila breviligulata*	3-6"	15-18	N40 39.795	W73 04.159	LW snow fence
	Ammophila breviligulata	1-5"	50-60			SW snow fence out 125'
P-4	*Ammophila breviligulata*	1-5"	50-60	N40 39.845	W73 03.951	SW snow fence out 75'
	Lathyrus japonicus	3-24"	18-21			SW snow fence out 40'
P-5	*Ammophila breviligulata*	1-3"	35-40	N40 39.885	W73 03.742	SW snow fence out 50'
	Ammophila breviligulata	1-3"	7			LW snow fence
P-6	(no vegetation)			N40 39.945	W73 03.527	scarp 1/2 up dune
P-7	*Ammophila breviligulata*			N40 39.998	W73 03.348	scarp "ate" seaward of dune

Appendix C—Invertebrate Surveys

Sub-Appendix C-1 Spring Invertebrate Survey Results

Western Fire Island

Date: 6/15/04
Location: Saltaire
Sample ID: Mid Beach Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Total	0	0.00	0.000	0.00

Date: 6/15/04
Location: Saltaire
Sample ID: Beachgrass Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Arachnida				
Araneae				
Trombidiformes	3	8.57	0.0005	1.10
Insecta				
Histeridae	1	2.86	0.0110	24.18
Notoxidae				
Notoxus spp	12	34.29	0.0100	21.98
Homoptera				
Cicadellidae	1	2.86	0.0010	2.20
Delphacidae				
Diptera				
Phoridae	6	17.14	0.0040	8.79
Hymenoptera				
Formicidae	12	34.29	0.0190	41.76
Total	35	100.00	0.0455	100.00

Date: 6/15/04
Location: Saltaire
Sample ID: Wrack Sight Sample

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Sciomyzidae	1	100.00	0.0010	100.00
Total	1	100.00	0.0010	100.00

Date: 6/14/04

Location: Saltaire

Sample ID: Surf Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	8	72.73	0.0005	0.19
Unidentified Nematode B	1	9.09	0.0005	0.19
Bivalvia				
Mytilus edulis				
Tellina agilis	1	9.09	0.0730	28.08
Arthropoda				
Arachnida				
Araneae				
Trombidiformes				
Crustacea				
Haustoriidae				
Haustorius canadensis	1	9.09	0.1870	71.92
Total	11	100.00	0.260	100.38

Date: 6/14/04

Location: Saltaire

Sample ID: Mid Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Mollusca				
Bivalvia				
Mytilus edulis	11	91.67	0.0200	97.56
Arthropoda				
Crustacea				
Caprellidae				
Paracaprella tenuis	1	8.33	0.0005	2.44
Total	12	100.00	0.021	100.00

Date: 6/14/04
Location: Saltaire
Sample ID: High Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Simuliidae				
Simulium spp.	1	33.33	0.0005	33.33
Crustacea				
Harpacticoida				
Unidentified Copepod	2	66.67	0.0010	66.67
Total	3	100.00	0.0015	100.00

Date: 6/15/04
Location: Saltaire
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
Mollusca				
Bivalvia				
Mytilus edulis	6	100.00	0.0050	100.00
Total	6	100.00	0.0050	100.00

Fire Island Pines

Date: 6/17/2004 0:00
Location: Fire Island Pines
Sample ID: Beachgrass Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Insecta				
Homoptera				
Cicadellidae	1	11.11	0.0020	22.22
Diptera				
Phoridae	7	77.78	0.0060	66.67
Hymenoptera				
Formicidae	1	11.11	0.0010	11.11
Total	9	100	0.009	100

Date: 6/17/2004 0:00

Location: Fire Island Pines

Sample ID: Supra-tide Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Insecta				
Coleoptera				
Histeridae	2	50.00	0.0260	5.98
Crustacea				
Amphipoda				
Talitridae				
Americorchestia longicornis	2	50.00	0.4090	94.02
Total	4	100	0.435	100

* Taxa found only in October

Date: 6/17/2004 0:00

Location: Fire Island Pines

Sample ID: Wrack Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Pit trap washed away in surf				
Total	0	0	0	0

* Taxa found only in October

6/17/2004 0:00

Location: Fire Island Pines

Sample ID: Wrack Sight Sample

Taxa	Number	% Occurrence	Weight	% Weight
Mollusca				
Bivalvia				
Mytilus edulis	1163	99.06	3.1630	99.61
Arthropoda				
Insecta				
Hemiptera				
Scutelleridae	1	0.09	0.0080	0.25
Delphacidae	1	0.09	0.0010	0.03
Diptera				
Cecidomyiidae	2	0.17	0.0005	0.02
Dolichopodidae	1	0.09	0.0005	0.02
Sciomyzidae	4	0.34	0.0010	0.03
Hymenoptera				
Diapriidae	1	0.09	0.0010	0.03
Ichneumonidae	1	0.09	0.0005	0.02
Total	1174	100	3.1755	100

* Taxa found only in October

Date: 6/16/2004 0:00

Location: Fire Island Pines

Sample ID: Surf Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	2	15.38	0.0005	33.33
Unidentified Nematode B				
Arthropoda				
Crustacea				
Amphipoda				
Lysianassidae				
Psammonyx nobilis	1	7.69	0.0005	33.33
Caprellidae				
Paracaprella tenuis	10	76.92	0.0005	33.33
Total	13	100	0.0015	100

* Taxa found only in October

Date: 6/16/2004 0:00
Location: Fire Island Pines
Sample ID: Mid-tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	6	100.00	0.0005	100.00
Unidentified Nematode B				
Total	6	100	0.0005	100

* Taxa found only in October

Date: 6/16/2004 0:00
Location: Fire Island Pines
Sample ID: High Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	1	20.00	0.0005	6.67
Mollusca				
Bivalvia				
Mytilus edulis	3	60.00	0.0060	80.00
Tellina agilis				
Arthropoda				
Insecta				
Crustacea				
Harpacticoida				
Unidentified Copepod	1	20.00	0.0010	13.33
Total	5	100	0.0075	100

* Taxa found only in October

Date: 6/17/2004 0:00
Location: Fire Island Pines
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
Mollusca				
Bivalvia				
Mytilus edulis	50	98.04	0.1110	99.11
Annelida				
Ampharetidae				
Asabellides oculata	1	1.96	0.0010	0.89
Total	51	100	0.112	100

Sub-Appendix C-2 Fall Invertebrate Survey Results

Western Fire Island

Date: 10/26/2004 0:00
Location: Saltaire
Sample ID: Beachgrass Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Arachnida				
Araneae				
Trombidiformes				
Unidentified Mite	1	16.67	0.0010	1.48
Insecta				
Homoptera				
Cicadellidae	1	16.67	0.0010	1.48
Delphacidae	2	33.33	0.0005	0.74
Hymenoptera				
Formicidae	1	16.67	0.0090	13.33
Lepidoptera				
Pieridae				
Colias spp.*	1	16.67	0.0560	82.96
Total	6	100.00	0.0675	100.00

* Taxa found only in October

Date: 10/26/2004 0:00
Location: Saltaire
Sample ID: Supra-Tide Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Hymenoptera				
Formicidae	1	25.00	0.0005	1.23
Crustacea				
Amphipoda				
Hyperiidae*				
Probably Themisto spp.	3	75.00	0.0400	98.77
Total	4	100.00	0.0405	100.00

* Taxa found only in October

Date: 10/26/2004 0:00
Location: Saltaire
Sample ID: Wrack Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
No Taxa Found; cup buried in sand by surf.				
Total	0	0.00	0.0000	0.00

* Taxa found only in October

Date: 10/26/2004 0:00
Location: Saltaire
Sample ID: Wrack Sight Sample

Taxa	Number	% Occurrence	Weight	% Weight
No Taxa Found				
Total	0	0.00	0.0000	0.00

* Taxa found only in October

Date: 10/25/2004 0:00
Location: Saltaire
Sample ID: Surf Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	22	100.00	0.0005	100.00
Total	22	100.00	0.0005	0.00

* Taxa found only in October

Date: 10/25/2004 0:00
Location: Saltaire
Sample ID: Mid Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	13	100.00	0.0005	100.00
Total	13	100.00	0.0005	0.00

* Taxa found only in October

Date: 10/25/2004 0:00
Location: Saltaire
Sample ID: High Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
No Taxa Found				
Total	0	0.00	0.0000	0.00

* Taxa found only in October

Date: 10/26/04
Location: Saltaire
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Crustacea				
Harpacticoida				
Unidentified Copepod	1	100.00	0.0005	100.00
Total	1	100.00	0.0005	100.00

* Taxa found only in October

Fire Island Pines

Date: 10/27/2004 0:00
Location: Fire Island Pines
Sample ID: Beach grass Pit trap

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Arachnida				
Araneae				
Thomisidae*	1	50.00	0.0030	75.00
Unidentifeid Spider				
Tetragnathidae*	1	50.00	0.0010	25.00
Unidentifeid Spider				
Total	2	100.00	0.0040	100.00

* Taxa found only in October

Date: 10/26/2005 0:00

Location: Fire Island Pines

Sample ID: Supra-tide Pit trap

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Otitidae*	1	50.00	0.0050	90.91
Hymenoptera				
Formicidae	1	50.00	0.0005	9.09
Total	2	100.00	0.0055	100.00

* Taxa found only in October

Date: 10/27/2004 0:00

Location: Fire Island Pines

Sample ID: Wrack Pit Trap

Taxa	Number	% Occurrence	Weight	% Weight
Arthropoda				
Insecta				
Diptera				
Otitidae*	1	100.00	0.0310	100.00
Total	1	100.00	0.0310	100.00

* Taxa found only in October

Date: 10/27/2004 0:00

Location: Fire Island Pines

Sample ID: Wrack Sight Sample

Taxa	Number	% Occurrence	Weight	% Weight
No Taxa Found				
Total	0	0.00	0.0000	0.00

* Taxa found only in October

Date: 10/26/2005 0:00
Location: Fire Island Pines
Sample ID: Surf Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	2	18.18	0.0005	0.06
Arthropoda				
Crustacea				
Decapoda				
Hippidae				
Emerita talipoida*	9	81.82	0.8820	99.94
Total	11	100.00	0.8825	100.00

* Taxa found only in October

Date: 10/26/2005 0:00
Location: Fire Island Pines
Sample ID: Mid Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
Nematoda				
Unidentified Nematode A	5	100.00	0.0005	100.00
Total	5	100.00	0.0005	0.00

* Taxa found only in October

Date: 10/26/2005 0:00
Location: Fire Island Pines
Sample ID: High Tide Core

Taxa	Number	% Occurrence	Weight	% Weight
No Taxa Found				
Total	0	0.00	0.0000	0.00

Date: 10/27/2004 0:00
Location: Fire Island Pines
Sample ID: Wrack Core

Taxa	Number	% Occurrence	Weight	% Weight
No Taxa Found				
Total	0	0.00	0.0000	0.00