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# BAR BEACH SALT MARSH RESTORATION HEMPSTEAD HARBOR, NEW YORK

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## THIRD YEAR MONITORING REPORT

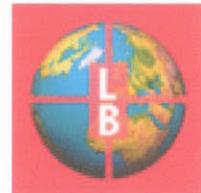
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*Submitted to:*  
**National Oceanic and Atmospheric Administration**  
New York, New York



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March 2007

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## EXECUTIVE SUMMARY

In 2003, The National Oceanic and Atmospheric Administration (NOAA), New York Department of Environmental Conservation, U.S. Fish and Wildlife Service restored the salt marsh in Bar Beach Lagoon, North Hempstead, New York, as part of a Superfund settlement (AES Shoreline Realty) addressing natural resource damages that had occurred as a result of the release of contaminants into Hempstead Harbor. Restoration activities included the removal of substantial volumes of fill consisting of sand, gravel, concrete, and solid waste debris from the site, as well as the physical removal of approximately 0.2 acres of common reed (*Phragmites australis*). Each of the fill removal areas was excavated to sub-grade, backfilled with clean soils, and planted with native wetland and coastal upland plant species. The Town of North Hempstead participated in the restoration through a NOAA Community-based Restoration Program grant award and provided access to the site and removal of the site fill debris.

The Louis Berger Group, Inc. conducted the third year monitoring of the five year monitoring program in May and September of 2006. This monitoring consisted of biological sampling of vegetation, nekton, and benthic macroinvertebrates at the restoration site and at a nearby reference site. Avian monitoring was conducted by an experienced birder (volunteer) affiliated with the North Shore Audubon society and arranged by NOAA staff. The monitoring program was developed in collaboration with NOAA staff, and in accordance with the Final Restoration Plan (NOAA *et al.* 2002).

After the third year of monitoring, the restoration site has met the 85 percent native species vegetative cover requirement. *Phragmites* and other undesirable invasive species have been limited to 10 percent or less of the total vegetative cover of the restored area, as set forth in the restoration plan. Quadrat sampling revealed that an average of 87.8 percent of the restoration site was covered with native vegetation, compared to 22.5 percent recorded during baseline pre-construction monitoring. The average height of *Spartina alterniflora* at the restoration site increased from 93 cm in 2004 to 114 cm in 2006. The percent of *Spartina* which were flowering was higher at the restoration site than at the reference site. Ground cover by *Phragmites* was limited to 0.3 percent of the restoration site.

Monitoring results indicate that nekton density and abundance at the restoration site are greater than that of the reference site. The nektonic community of the restoration site is as diverse as that of the reference site, and species richness of both sites is the same. Monitoring results also suggest that the restoration site supports a more diverse benthic macroinvertebrate community than the reference site. Benthic macroinvertebrate species richness was the same for the two sites, but abundance at the restoration site was considerably lower than that of the reference site due to the presence of well-established beds of the ribbed mussel. The restoration site had lower avian abundance than the reference site, but higher diversity, probably due to differences in the surrounding habitats of each site, as well as the presence of flocking species at the reference site. Species richness of birds at the restoration site was greater than that of the reference site.

The third year monitoring results indicate that restoration efforts to date have been successful in establishing a diverse population of salt marsh plant and animal species. The planted salt marsh grasses are well established and flowering. The coastal shoreline zone in particular, has greater cover than in previous years. Bare patches observed on the marsh at the restoration site in May had filled in by September. Recommendations include removal of mugwort and Japanese knotweed by the gazebo and a stand of *Phragmites* by the boat ramp.

## 1.0 INTRODUCTION

In 2003, The National Oceanic and Atmospheric Administration (NOAA), New York Department of Environmental Conservation, U.S. Fish and Wildlife Service, and the Town of North Hempstead restored the salt marsh in Bar Beach Lagoon (also known as Hempstead Harbor Cove, see Figure 1), North Hempstead, New York, as part of a Superfund settlement addressing natural resource damages that had occurred as a result of the release of contaminants into Hempstead Harbor. Prior to restoration activities, Bar Beach Lagoon consisted of mudflats and sparsely vegetated hummocks, and dense stands of common reed (*Phragmites australis*) covered the high marsh and coastal uplands. Concrete debris and other fill had been dumped along much of the shoreline, possibly for erosion control. Restoration activities included the removal of substantial volumes of fill consisting of sand, gravel, concrete, and solid waste debris from the site. Removal of *Phragmites* was also a component of the project, and involved physical removal of approximately 0.2 acres. Each of the fill removal areas was excavated to sub-grade, backfilled with clean soils, and planted with native wetland and coastal upland plant species.

Smooth cordgrass (*Spartina alterniflora*) was planted in the intertidal zone at elevations from 2.5 to 4 feet National Geodetic Vertical Datum (NGVD). Salt marsh cordgrass (*Spartina patens*) and spikegrass (*Distichlis spicata*) were planted in the high marsh at elevations from 4 to 5 feet NGVD. Between the high marsh and the upland, a coastal shoreline zone consisting of marsh elder (*Iva frutescens*), groundsel-bush (*Baccharis halimifolia*), perennial ryegrass (*Panicum amarum*), and seaside goldenrod (*Solidago sempervirens*) was planted. Upland areas adjacent to the restoration site were seeded with a native warm season grass mixture and various native shrubs were planted in the upland periphery. Additional plantings in 2004 augmented the 2003 plantings where mortality, erosion, and fill compaction occurred. In 2004, switch grass (*Panicum virgatum*) plugs were planted in the upland to address areas that did not respond well to seeding. Virginia creeper (*Parthenocissus virginiana*) was initially planted in the upland area, but because its survival was poor and the primary purpose for the plantings was stabilization of soils, it was not replanted. In the spring of 2005, the Performing Parties Group replanted the center portion of the peninsula area of the restoration site with *Spartina alterniflora* and also erected herbivore-exclusion fence and overhead string. Dead shrubs in the coastal shoreline zone were also replaced and *Spartina patens* was replanted at the eastern end of the site where ice damage had occurred.

As part of the Superfund settlement, a monitoring program was implemented to assess the extent of success of the restoration project. The performance criteria for the restoration project requires 85 percent vegetative cover of the restoration area (marsh and stabilized coastal shoreline) within 5 years of initial planting and minimal re-establishment of *Phragmites* and other undesirable invasive vegetation to 10 percent or less of the total restored area. Performance criteria also included 90 percent survival of *Spartina alterniflora* and shoreline vegetation after two full growing seasons, which was independently evaluated by NOAA and not discussed in this report. In addition, fish, benthic macroinvertebrate, and avian species abundance, richness, and composition must demonstrate a strong positive trend toward and not significantly differ from that of a reference marsh. The reference marsh, located 600 feet to the northeast of the restoration site, is also a fringing marsh and was selected to serve as the reference site for this monitoring program. The baseline reference marsh used by NOAA during pre-restoration monitoring, located approximately half a mile south of Bar Beach Lagoon, was not selected as the reference site for post-construction monitoring because it is larger and similarly exposed as the newly selected reference site. The restoration and reference sites are similar in size, each consisting of approximately 0.75 acres.

On behalf of NOAA, The Louis Berger Group, Inc. conducted the spring component of the third year of monitoring on May 24<sup>th</sup> and 25<sup>th</sup>, of 2006, and the fall monitoring on September 28<sup>th</sup> and 29<sup>th</sup>, of 2006. Nekton and benthic macroinvertebrates were monitored during the spring and fall, while vegetation was only monitored during the fall, in accordance with the schedule presented in Table 1 and agreed upon by Berger and NOAA. Vegetation monitoring occurs annually in the fall, while nekton and benthic monitoring is conducted during the spring and fall, but only every other year. Avian monitoring was conducted by an

experienced birder (volunteer) arranged by NOAA staff. The monitoring program was developed in collaboration with NOAA staff, and in accordance with the Final Restoration Plan (NOAA *et al.* 2002).

**Table 1. Monitoring Schedule.**

Year	Season	Monitoring Parameter		
		Vegetation	Nekton and Benthos	Avian
2004	Spring			
	Fall	✓	✓	✓
2005	Spring			✓
	Fall	✓		✓
2006	Spring		✓	✓
	Fall	✓	✓	✓
2007	Spring			?
	Fall	✓		?
2008	Spring		✓	?
	Fall	✓	✓	?



National Oceanic and Atmospheric Administration	
Bar Beach Salt Marsh Ecological Restoration Monitoring Site Location Map	
Location: Hempstead Harbor, Long Island, NY	
Date: DEC 2006	ID: JR 5110
 The Louis Berger Group, Inc. 30A Vreeland Road Florham Park, NJ 07932	Figure 1

SOURCES:  
 Base Mapping: USGS 7.5 Minute Topographic Map, Sea Cliff Quadrangle.

## 2.0 VEGETATION MONITORING

### 2.1 Methodology

Plant cover at the restoration site and reference site was measured within one-meter square quadrats placed along permanently established transects. The restoration site was sampled along seven transects composed of forty quadrats. Six of these transects were oriented from the upland to the lower edge of the marsh, while the seventh transected the peninsula area from southwest to northeast. The reference site was sampled along three transects composed of ten quadrats, also oriented from upland to the lower edge of the marsh. At NOAA's request, quadrats were arranged so that the first quadrat was positioned in the coastal shoreline zone (above 5 feet NGVD), the second quadrat was placed in the high marsh (4 to 5 feet NGVD), and subsequent quadrats were placed in the low marsh (2.5 to 4 feet NGVD).

The ends of each transect were marked in the field with PVC pipes driven into the substrate and were surveyed with a Trimble Pro XRS Global Positioning System (GPS) with Asset Surveyor. The distance of each quadrat along the transect was measured and recorded to ensure that the same quadrats will be sampled each year. The locations of the vegetation transects appear in Figure 2, and the positions of the transect ends and quadrats are presented in Appendix A. The elevations of each quadrat were measured in 2004 and 2005, to determine if any fill compaction was occurring, but results indicated that there were no discernable elevation changes during this period.

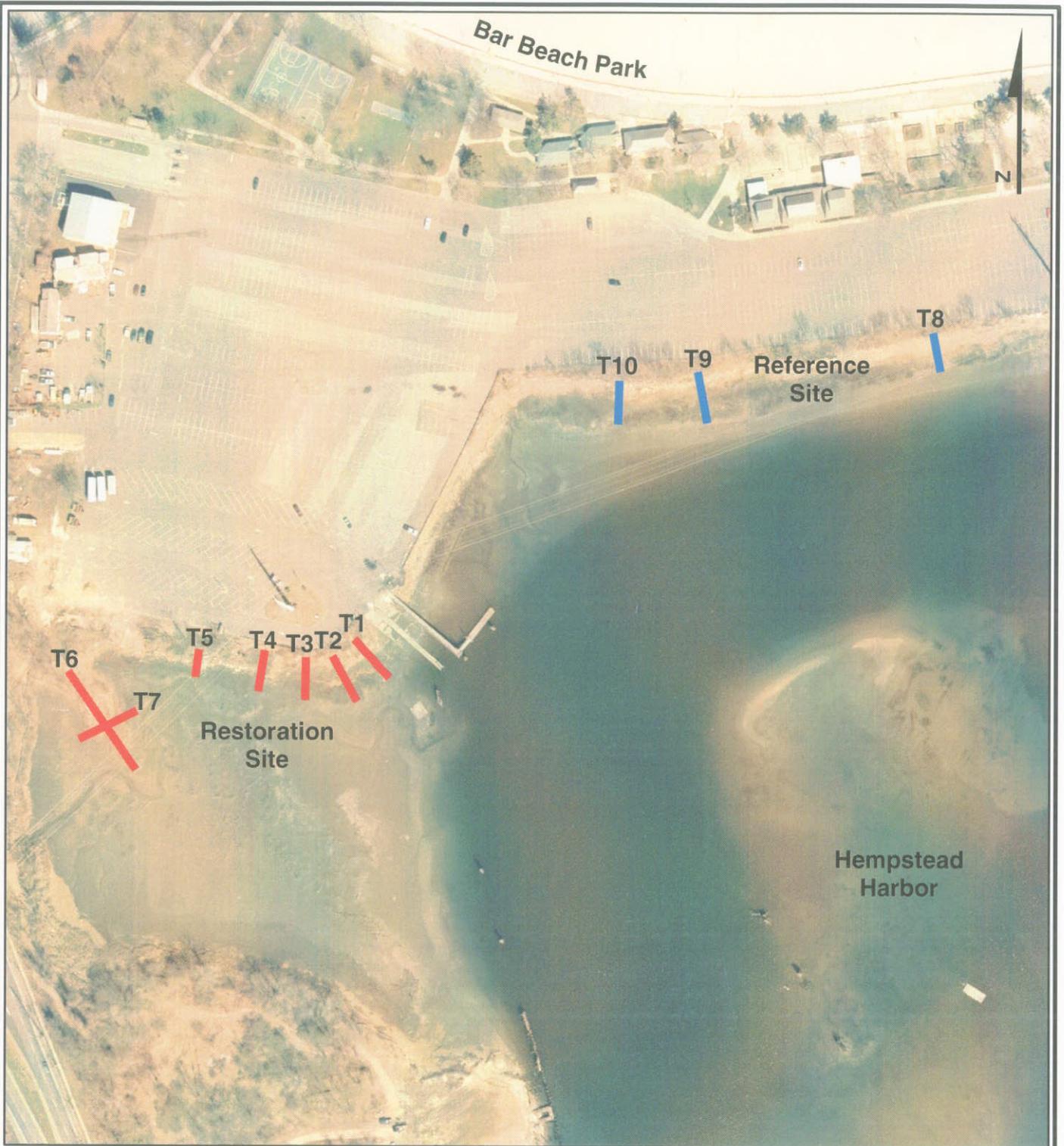
### 2.2 Results

A summary of vegetation observed within sampled quadrats at the restoration and reference sites is presented in Table 2. A total of 11 species were present within the sampled quadrats at the restoration site, seven of which were planted and four which volunteered, including *Phragmites*. The coastal shoreline zone at the restoration site was primarily vegetated with the planted species *Iva frutescens*, *Panicum amarum*, *Solidago sempervirens*, and *Spartina patens*, while the marsh vegetation consisted almost entirely of *Spartina alterniflora*, *Spartina patens*, and *Distichlis spicata*. Sea blite (*Sueda linearis*) and switchgrass (*Panicum virgatum*) are also present at the restoration site, but were not present within sampled quadrats. Only four species were present within the sampled quadrats at the reference site. Vegetation in the coastal shoreline zone of the reference site was dominated by *Phragmites*, *Spartina alterniflora*, *Parthenocissus cinquefolia*, and *Iva frutescens*, while marsh vegetation consisted exclusively of *Spartina alterniflora* and *Phragmites*.

**Table 2. Plant Species Observed in Sampled Quadrats.**

Common Name	Scientific Name	Restoration Site	Reference Site
marsh orach	<i>Atriplex patula</i>	✓	
groundsel tree*	<i>Baccharis halimifolia</i>	✓	
spike grass*	<i>Distichlis spicata</i>	✓	
high tide bush*	<i>Iva frutescens</i>	✓	✓
perennial ryegrass*	<i>Panicum amarum</i>	✓	
Virginia creeper*	<i>Parthenocissus cinquefolia</i>		✓
common reed	<i>Phragmites australis</i>	✓	✓
pearlwort	<i>Sagina procumbens</i>	✓	
glasswort	<i>Salicornia europa</i>	✓	
seaside goldenrod*	<i>Solidago sempervirens</i>	✓	
smooth cordgrass*	<i>Spartina alterniflora</i>	✓	✓
salt meadow grass*	<i>Spartina patens</i>	✓	

\*Species planted or seeded at the restoration site



**Legend**

- Vegetation Transects
- Restoration Site
  - Reference Site



SOURCES:  
 Base Mapping: New York State DOQQs,  
 Nassau County, 2000.

National Oceanic  
 and Atmospheric Administration

Bar Beach Salt Marsh  
 Ecological Restoration Monitoring  
 Transect Location Map

Location: Hempstead Harbor, Long Island, NY

Date: DEC 2006 ID: JR 5110



The Louis Berger Group, Inc.  
 30A Vreeland Road  
 Florham Park, NJ 07932

Figure 2

**Figure 3. Overview of the Restoration Site.**

Table 3 presents a summary of vegetative ground cover, including cover by *Phragmites*, for each transect in the restoration and reference sites, as well as the mean value for these parameters across all transects at each site. Quadrat sampling indicates that native vegetative cover of the restoration site was 87.8 percent, representing a slight increase over the 2005 observation of 84 percent native cover. *Phragmites* accounted for 0.3 percent of cover, representing a very slight decrease from the 2005 observation of 0.4 percent *Phragmites* cover. Total native vegetative cover of quadrats at the reference site was 66 percent, with *Phragmites* covering 14 percent of ground.

Prior to restoration activities, the upper elevations of the restoration site were dominated by *Phragmites*, while lower elevations were either unvegetated, or contained some *Spartina alterniflora*. Sampling conducted by NOAA in 2002 before the restoration indicated that total plant cover of the restoration site was approximately 47 percent, with *Spartina alterniflora* covering 22.5 percent of sampled quadrats and *Phragmites* covering 14.5 percent of quadrats sampled. High tide bush, spikegrass, poison ivy (*Toxicodendron radicans*), mugwort (*Artemisia vulgaris*), sea lavender (*Limonium* sp.), and glasswort were also present, but accounted for relatively little cover.

Mean *Spartina alterniflora* height within quadrats at the restoration site was 114 cm, an increase over the 103 cm average height in 2005, which was also an increase over the 93 cm observed in 2004. In 2002, prior to the restoration, NOAA staff measured *Spartina alterniflora* height at the restoration site, finding the mean height of the remnant plants in the lower tidal elevations to be 116 cm. The mean height of plants in quadrats at the reference site was 108 cm, similar to the 110 cm average height in 2005. After four growing seasons, plants at the restoration site have reached the average height of plants there prior to the restoration and plants at the reference site. At the restoration site, 66.1 percent of *Spartina alterniflora* measured were

flowering, while at the reference site, 51.9 percent of plants sampled were flowering. Flowering data were not collected in 2004 or 2005, so no comparisons are possible.

**Table 3. Summary of Vegetative Ground Cover**

Transect	Number of Quadrats	Mean Percent Vegetative Ground Cover for All Species Excluding <i>Phragmites</i>	Mean Percent Vegetative Ground Cover of <i>Phragmites</i>	Mean Total Percent Cover
Restoration Site				
1	5	86	0	86
2	5	91	0	91
3	5	95	0	95
4	5	66	0	66
5	5	92	2	94
6	10	90	0	90
7	5	93	0	93
Mean (all quadrats)		87.8	0.3	88
Reference Site				
8	3	82	3	85
9	4	46	33	79
10	3	77	0	77
Mean (all quadrats)		66	14	80

Plant field data documenting the ground cover estimates for the restoration and reference sites, as well as *Spartina alterniflora* height measurements and flowering status, are presented in Appendix B. Photographs taken along each transect at the restoration site appear in Appendix C. Appendix G contains NOAA pre-restoration monitoring of percent plant cover by species at the restoration site.

## 3.0 NEKTON MONITORING

### 3.1 Methodology

Nekton use of the restoration and reference sites was investigated by means of throw trap sampling conducted around the time of high tide. Nekton sampling was conducted in May and September of 2006. Fifteen stations were sampled, following the protocol established in conjunction with NOAA in 2004. Ten stations were sampled at the restoration site, and five were sampled at the reference site. The throw locations ranged from high marsh to low marsh. The throw trap consisted of an open-ended one-meter square polycarbonate box measuring 75 cm in height. Sampling was conducted by throwing the trap onto the flooded marsh surface so that the open end fully contacted the substrate, preventing any escape. Sampling locations were limited to areas of relatively flat substrate where *Spartina alterniflora* growth was not so dense as to prohibit the trap from fully contacting the substrate. Fish and invertebrates were removed from the trap by passing a meter-wide net of 0.25-inch mesh through the trap. Repeated passes of the net through the trap were made until three successive passes failed to produce any fish or shrimp. All fish were identified to species and measured before being released. Invertebrates were identified to genus and counted.

**Figure 4. Throw Trap Sampling for Nekton.**



### 3.2 Results

Table 4 presents the pooled spring and fall nekton sampling results, including species richness, abundance, diversity, and density for nekton collected in the throw traps at the restoration and reference sites. Nekton field data for the spring and fall sampling events are provided in Appendix D. A total of four fish species were caught at the reference and restoration sites: mummichog (*Fundulus heteroclitus*), striped killifish (*Fundulus majalis*), Atlantic silverside (*Menidia menidia*), and sheepshead minnow (*Cyprinodon variegatus*). Grass shrimp (*Palaemonetes* sp.) were also included in the analysis, as they were caught in significant numbers. All of these species were caught by NOAA during pre-restoration monitoring. With the exception of the one sheepshead minnow caught, all of these species had previously been caught during post-construction monitoring.

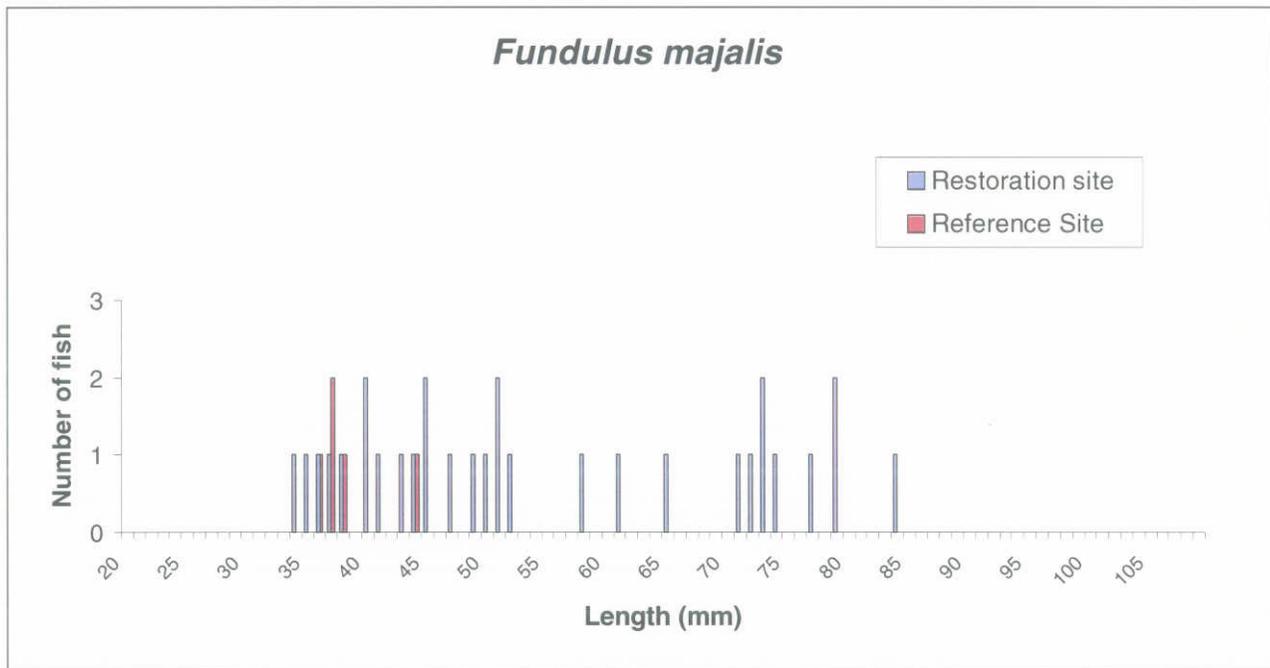
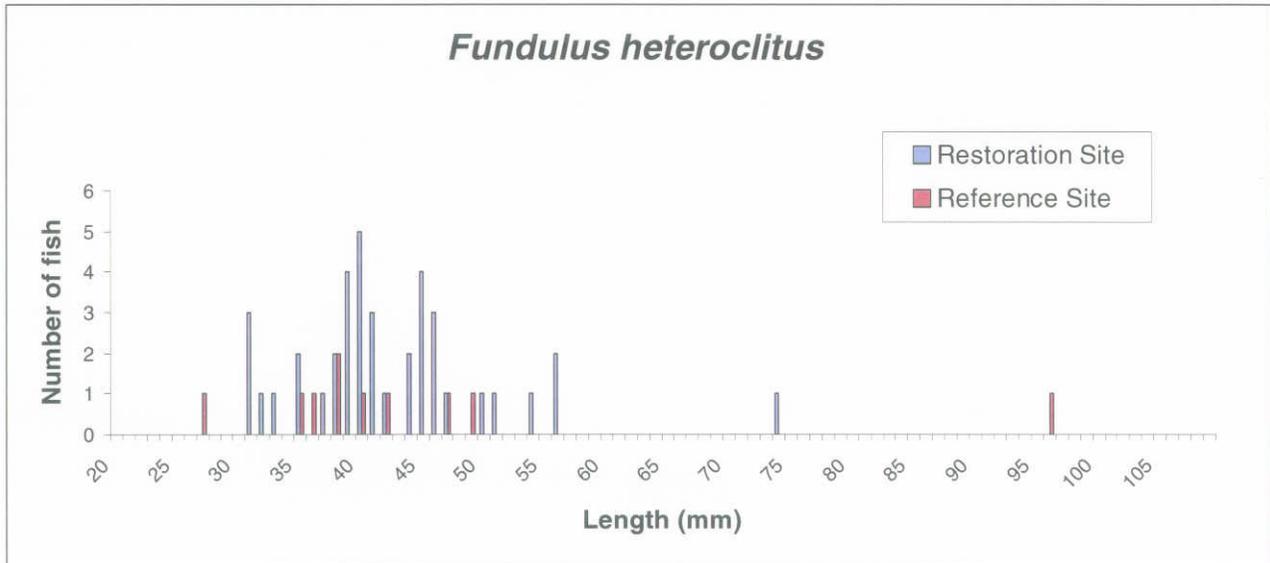
Overall fish abundance, as measured by the mean number of fish per trap throw, was 4 fish at the restoration site, which was higher than the abundance of 1.6 fish at the reference site. Very few fish were caught during the spring sampling event, possibly because the *Spartina alterniflora* height was only 30 to 40 cm at this time of year. Fish density for the restoration site, with a mean of 7.9 fish per cubic meter of water, was markedly higher than the density of 4.2 fish at the reference site. Fish diversity, as measured by the Shannon-Weaver Diversity Index, was 0.367 at the restoration site, which was very similar to the reference site diversity index of 0.360. Grass shrimp abundance and density were higher at the restoration site than at the reference site. At the restoration site, grass shrimp mean abundance was 13.8 shrimp per throw, and the density was 27.6 shrimp per cubic meter of water. At the reference site, mean shrimp abundance was 8.2 shrimp per throw, and the density was 21.6 shrimp per cubic meter of water.

**Table 4. Summary of Nekton Sampling Results.**

Species		Restoration Site (10 throws)		Reference Site (5 throws)	
Common Name	Scientific Name	Number Caught	Mean Abundance	Number Caught	Mean Abundance
Mummichog	<i>Fundulus heteroclitus</i>	44	2.2	10	1
Striped killifish	<i>Fundulus majalis</i>	31	1.6	5	0.5
Atlantic silversides	<i>Menidia menidia</i>	4	0.2	0	--
Sheepshead minnow	<i>Cyprinodon variegatus</i>	0	--	1	0.1
Grass shrimp	<i>Palaemonetes</i> sp.	275	13.8	82	8.2
All Fish Species		79	4.0	16	1.6
Fish Species Richness		3		3	
Fish Diversity Index		0.367		0.360	
Fish Density (fish per m <sup>3</sup> )		7.9		4.2	
Grass Shrimp Density (shrimp per m <sup>3</sup> )		27.6		21.6	

The length frequency distributions of *Fundulus heteroclitus* and *Fundulus majalis* from the fall sampling event appear in Figure 5. Lengths from all trap throws within the restoration sites were pooled, as were all throws within the reference site. Very few *Menidia menidia* or *Cyprinodon variegatus* were caught during the fall, and so these species were not plotted. Also, few fish were caught during the spring sampling event (n=6), and so these fish were not plotted. Members of the 2005 and 2006 year classes of both *Fundulus* species were found at the restoration site and reference site during the fall, with these classes consisting of length categories of approximately 30-55 mm and 70-100 mm, respectively.

Figure 5. Fish Length Frequency Distributions.



## 4.0 BENTHIC MACROINVERTEBRATE MONITORING

### 4.1 Methodology

Benthic macroinvertebrate monitoring was conducted in May and September of 2006 using 0.25-meter square quadrats randomly laid on the marsh surface. All macroinvertebrates observed within the quadrats were identified and recorded. In the case of fiddler crabs, burrows were counted. Quadrat sampling was stratified in order to sample both high marsh and low marsh habitats, with the majority of quadrats located in the low marsh, which accounts for most of the area of both sites. Twenty-five quadrats were sampled at the restoration site (five in the high marsh and twenty in the low marsh), and fifteen quadrats were sampled at the reference site (three in the high marsh and twelve in the low marsh), except in September, when only twelve quadrats were sampled (three in the high marsh and nine in the low marsh) due to the onset of heavy rains on the final sampling day.

**Figure 6. Benthic Macroinvertebrate Quadrat Sampling.**



### 4.2 Results

Table 5 presents macroinvertebrate species composition, abundance, richness, and diversity for the restoration and reference sites, pooled from spring and fall quadrat sampling. Macroinvertebrate field data for each sampling event are provided in Appendix E. A total of seven macroinvertebrate species were found in quadrats at the restoration site and the reference site. Ribbed mussels (*Geukensia demissa*) and mud snails (*Nassarius obsoletus*, also known as *Ilyanassa obsoleta*) dominated the macroinvertebrate communities at both sites. Burrows of the mud fiddler crab (*Uca pugnax*) were present at both sites, but were much more abundant at the restoration site. Individuals of several other crab and snail species were also observed.

Macroinvertebrate abundance in the high marsh was low, relative to the low marsh. At both the restoration site and reference site, just a few fiddler crab burrows and marsh snails were present in the high marsh.

Overall, mean macroinvertebrate abundance at the restoration site was 63.3 individuals per quadrat, which is substantially lower than the mean of 189.6 individuals per quadrat at the reference site. This difference, also observed in 2004, is due to the high abundances of ribbed mussels and mud snails at the reference site, as most other macroinvertebrates occurred at both sites in relatively similar abundances. Ribbed mussels were more than three times as abundant at the reference site than at the restoration site. The distribution of ribbed mussels at the restoration site was generally limited to the lower edge of the low marsh, where *Spartina alterniflora* existed prior to the restoration, whereas high densities of this species are present nearly throughout the *Spartina alterniflora* at the reference site. Ribbed mussels will continue to colonize the restoration site, but it is unknown if they will ever approach the high densities observed at the reference site. Species richness at both sites was six, though each site had one species not found at the other. Macroinvertebrate diversity, as measured by the Shannon-Weaver Diversity Index, was 0.35 at the restoration site, which was higher than the reference site diversity index of 0.305, both of which were very close to the diversities observed in 2004 (restoration=0.349; reference =0.285).

**Table 5. Summary of Benthic Macroinvertebrate Sampling Results.**

Species		Restoration Site	Reference Site
Common Name	Scientific Name	Mean Abundance (per ¼ m <sup>2</sup> )	Mean Abundance (per ¼ m <sup>2</sup> )
Mud fiddler crab	<i>Uca pugnax</i>	2.4	0.6
Asian shore crab	<i>Hemigrapsus sanguineus</i>	--	0.1
Green crab	<i>Carcinus maenas</i>	0.02	0.04
Ribbed mussel	<i>Geukensia demissa</i>	20.6	75.6
Salt marsh snail	<i>Melampus bidentatus</i>	0.04	0.1
Mud snail	<i>Nassarius obsoletus</i>	40	113.1
Rough periwinkle	<i>Littorina saxatilis</i>	0.2	--
All Species		63.3	189.6
Species Richness		6	6
Diversity Index		0.35	0.305

Differences between the physical conditions at the restoration and reference sites may also be responsible for some macroinvertebrate species distributions. For example, the greatest density of fiddler crab burrows was in the peninsula area of the restoration site, where the substrate is nearly level, whereas the reference site has a relatively uniform slope. Differences in sediment grain size between the sites are also probably responsible for the observed differences in benthic communities. The reference site is also more exposed to wave energy than the restoration site and its high marsh zone is characterized by sparse vegetation and heavy cover of wrack and debris.

Horseshoe crabs (*Limulus polyphemus*) were observed paired up for mating on the peninsula during the May sampling event and numerous nest pits were present near the tip of the peninsula and near transect 4. Careful excavation of several pits revealed that they contained eggs. Numerous paired crabs and nest pits were also present across the lagoon along the sandy shoreline.

## **5.0 AVIAN MONITORING**

### **5.1 Methodology**

Avian monitoring was conducted by an ornithologist from the North Shore Audubon Society arranged by NOAA. During 2006, monitoring was conducted each month and typically at least twice a month, for a total of 39 sampling events. The ornithologist spent 20 minutes at the restoration site and 20 minutes at the reference site, and noted the bird species present within each site, their numbers and activity, as well as the weather and tide conditions. Birds within 100 yards of the restoration and reference sites were also noted, but not included in the analysis, as they were generally flying through the area, or were between the sites in the parking lot or on the power lines or towers.

### **5.2 Results**

Table 6 presents avian species abundance, richness, composition, and diversity for the restoration and reference sites. Avian monitoring data are provided in Appendix F. Twenty avian species were observed at the restoration site, while twelve were observed at the reference site. Mean avian abundance per observation at the restoration site was 3.7, which was considerably lower than the mean of 8.5 birds per observation at the reference site. Avian diversity, as measured by the Shannon-Weaver Diversity Index, was 0.992 at the restoration site, which was considerably higher than the reference site diversity index of 0.672. Both songbirds and waterbirds were well represented at the restoration site, while the bird community at the reference site consisted almost entirely of the flocking species Canada goose, Ring-billed gull, and the non-native European starling. The greater avian species richness and diversity of the restoration site as compared to the reference site and the difference in species composition are likely due to bordering habitat differences. The waters adjacent to the restoration site are less exposed to wind and waves than the reference site and the restoration site is nearly surrounded by densely forested habitat providing a close source of food and shelter for songbirds. The observed differences in species composition and abundance between the restoration site and reference site were very similar to observations presented in the Year 2 monitoring report.

**Table 6. Summary of Avian Monitoring Results.**

Species		Restoration Site		Reference Site	
Common Name	Scientific Name	Number of Individuals	Mean Abundance	Number of Individuals	Mean Abundance
Canada Goose	<i>Branta canadensis</i>	50	1.3	132	3.4
Mute Swan	<i>Cygnus olor</i>	12	0.3	12	0.3
Mallard	<i>Anas platyrhynchos</i>	4	0.1	17	0.4
Great Blue Heron	<i>Ardea herodias</i>	1	0.03	0	--
Little Blue Heron	<i>Egretta caerulea</i>	1	0.03	0	--
Great Egret	<i>Ardea alba</i>	3	0.1	5	0.1
Snowy Egret	<i>Egretta thula</i>	2	0.1	2	0.1
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	4	0.1	0	--
Belted Kingfisher	<i>Ceryle alcyon</i>	2	0.1	0	--
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	1	0.0	0	--
Herring Gull	<i>Larus argentatus</i>	0	--	3	0.1
Great Black-backed Gull	<i>Larus marinus</i>	0	--	1	0.03
Laughing Gull	<i>Larus atricilla</i>	0	--	2	0.1
Ring-billed gull	<i>Larus delawarensis</i>	0	--	68	1.7
Robin	<i>Turdus migratorius</i>	1	0.03	0	--
Mourning Dove	<i>Zenaidura macroura</i>	8	0.2	0	--
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	19	0.5	0	--
Savannah Sparrow	<i>Passerculus sandwichensis</i>	2	0.1	0	--
Song Sparrow	<i>Melospiza melodia</i>	10	0.3	2	0.1
Goldfinch	<i>Carduelis tristis</i>	2	0.1	0	--
Northern Mockingbird	<i>Mimus polyglottos</i>	3	0.1	0	--
Willow Flycatcher	<i>Empidonax traillii</i>	1	0.03	0	--
Grackle	<i>Quiscalus quiscula</i>	0	--	1	0.03
House Sparrow	<i>Passer domesticus</i>	15	0.4	0	--
House Finch	<i>Carpodacus mexicanus</i>	4	0.1	0	--
Starling	<i>Sturnus vulgaris</i>	0	--	86	2.2
All species		145	3.7	331	8.5
Species Richness		20		12	
Diversity Index		0.992		0.672	

## 6.0 SUMMARY

After the third year of monitoring, the restoration site has met the 85 percent native species vegetative cover requirement and re-establishment of *Phragmites* and other undesirable invasive species has been limited to 10 percent or less of the total restored area, as set forth in the restoration plan. Quadrat sampling revealed that an average of 87.8 percent of the restoration site was covered with native vegetation. Ground cover by *Phragmites* was limited to 0.3 percent of the restoration site. Comparisons with NOAA pre-restoration monitoring indicate substantially greater coverage of the restoration site with native wetland vegetation, and the near-total eradication of *Phragmites*. In 2002, prior to the restoration, only 47 percent of the site had vegetative cover, nearly a third of which consisted of *Phragmites*. Table 7 summarizes the monitoring results for all parameters investigated at the restoration and reference sites in 2006.

**Table 7. Summary of 2006 Monitoring Results**

Resource	Monitoring Result	Restoration Site	Reference Site	Restoration Site compared to Reference site
Vegetation	Percent Ground Cover (excluding <i>Phragmites</i> )	87.8	66	+
	Percent Cover by <i>Phragmites</i>	0.3	14	+
	Species Richness	11	4	+
Nekton	Mean Abundance	11.6	1.6	+
	Species Richness	3	3	=
	Diversity Index	0.367	0.36	=
	Mean Fish Density (fish per m <sup>3</sup> )	7.9	4.2	+
	Mean Shrimp Density (grass shrimp per m <sup>3</sup> )	27.6	21.6	+
Benthic Macroinvertebrates	Mean Abundance	63.3	189.6	-
	Species Richness	6	6	=
	Diversity Index	0.35	0.305	+
Avian	Mean Abundance	3.7	8.5	-
	Species Richness	20	12	+
	Diversity Index	0.992	0.672	+

Monitoring results indicate that the nekton community of the restoration site is as diverse as that of the reference site. Monitoring results also suggest that the restoration site supports more diverse benthic macroinvertebrate and avian communities than the reference site. Species richness of nekton and benthic invertebrates at the restoration site were equal to that of the reference site. Fish and grass shrimp density and abundance at the restoration site were greater than that of the reference site. Benthic macroinvertebrate abundance at the restoration site was considerably lower than that of the reference site, but this is due to high densities of ribbed mussels at the reference site. The expansion of the existing mussel beds at the restoration site is expected to take years, as the dense mussel beds observed at the reference site (extrapolated at over 1,000 mussels per m<sup>2</sup> in some areas) are relatively undisturbed and have certainly been present for decades. Avian diversity and species richness at the restoration site are greater than that of the reference site. Avian abundance at the restoration site was considerably lower than the reference site, due to the presence of three flocking species, including a non-native species, at the reference site. Differences in the composition of the avian communities at the restoration and reference site are probably due to differences in the surrounding habitats of each site.

Table 8 summarizes the parameters monitored at the restoration site in 2004, 2005, and 2006. The vegetative monitoring data are directly comparable across years. The nekton, benthic, and avian data are not directly comparable across years, as these parameters were monitored according to different schedules. The 2004

avian data only included the period from October to December of 2004, as opposed to the year-round data collected in 2005 and 2006. Additionally, the nekton data for 2004 were only collected in the fall, when the marsh vegetation is at its tallest, resulting in a greater amount of sheltered habitat and high catches of fish and shrimp during sampling. The 2006 nekton data includes sampling in May, when the marsh grass was still short, and few fish or shrimp were caught. Likewise, the benthic data for 2006 included spring and fall sampling, while the 2004 data only consisted of fall sampling. It should also be noted that the data include only species which were found within sampled quadrats. Other species, such as horseshoe crabs and amphipods, were observed at the restoration site during sampling.

The percent cover of native vegetation at the restoration site has increased every year since 2004. The average height of *Spartina alterniflora* has also increased every year since 2004. The presence of *Phragmites* at the site is low, and has remained essentially unchanged since 2004. The nekton and benthic macroinvertebrate monitoring data indicate that restoration site supports diverse nektonic and benthic communities. Several species of snails and crabs not encountered by NOAA prior to restoration in 2002 are now common inhabitants (marsh snail, rough periwinkle, green crab, and Asian shore crab). Avian monitoring data also indicate that the restoration site supports a diverse avian community, with songbirds and waterbirds being well represented.

**Table 8. Restoration Site Comparisons, 2004-2006**

Resource	Monitoring Result	2004	2005	2006
Vegetation	Percent Ground Cover (excluding <i>Phragmites</i> )	83	84	87.8
	Percent Cover by <i>Phragmites</i>	0.5	0.4	0.3
	Species Richness	12	11	11
	Mean <i>Spartina alterniflora</i> height	93	103	114
Nekton	Mean Abundance	21.6	NS	11.6*
	Species Richness	3	NS	3*
	Diversity Index	0.337	NS	0.367*
Benthic Macroinvertebrates	Mean Abundance	76.8	NS	63.3*
	Species Richness	6	NS	6*
	Diversity Index	0.349	NS	0.35*
Avian	Mean Abundance	4.9	3	3.7
	Species Richness	8	23	20
	Diversity Index	0.771	1.137	0.992

NS=not sampled

Values followed by an asterisk (\*) are results of pooled spring and fall data

### Management Recommendations

The third year monitoring results indicate that restoration efforts to date have been successful in establishing a diverse population of salt marsh plant and animal species. The planted salt marsh grasses and coastal shoreline zone vegetation have become well established. Based upon monitoring results, Berger does not recommend any planting at this time. *Phragmites* presence is minimal at the restoration site, however, there is a small stand of *Phragmites* along the shoreline near the boat ramp, as well as some mugwort and Japanese knotweed near the gazebo. It is recommended that the Town of North Hempstead, as owner of the property, remove these invasive plants under the supervision of a qualified botanist.

## 6.0 REFERENCES

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**APPENDICES**

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**APPENDIX A**  
**VEGETATION QUADRAT LOCATIONS AND ELEVATIONS**

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## Bar Beach Vegetation Monitoring Quadrat Locations

Reference Site															
Transect and Quadrat position (transect lengths and quadrat locations as measured along a tape measure laid between the PVC end pipes)															
End	northing	easting	Quadrat	Distance from lower pipe (m)	End	northing	easting	Quadrat	Distance from lower pipe (m)						
T1up	240496.692	1079543.771	1	21.0	T8up	240917.997	1080339.707	1	14						
T1low	240443.858	1079592.021	2	18.3	T8low	240865.224	1080350.428	2	6.1						
T1 total length 22.07 m			3	13.8	T8 total length 16.0 m			3	0.7						
			4	7.7				T9up	240863.950	1080015.822	1	18.5			
			5	0.9				T9low	240794.065	1080028.913	2	14.8			
			T2up	240473.546	1079513.559	1	21.0	T9 total length 21.6 m			3	6.7			
T2low	240411.422	1079547.602	2	18.4	4	0.5									
T2 total length 21.95 m			3	15.8	T10up	240851.720	1079907.820	1	12.3						
			4	7.7	T10low	240792.253	1079905.867	2	5.6						
			5	0.5	T10 total length 19.0 m			3	0.6						
T3up	240471.818	1079476.992	1	17.6											
T3low	240413.046	1079475.841	2	15.2	T3 total length 17.95 m			3	9.8						
T3 total length 17.95 m			4	4.9											
			5	0.6											
T4up	240481.267	1079420.387	1	15.1	T4 total length 17.50 m			3	7.8						
T4low	240425.061	1079411.027	2	12.6				4	5.4						
T4 total length 17.50 m			5	0.5											
			T5up	240482.271	1079329.557	1	9.9	T5 total length 12.1 m			3	5.3			
T5low	240444.181	1079324.130	2	7.7	4	2.9									
T5 total length 12.1 m			5	0.7											
			T6up	240451.950	1079149.276	1	47.4	T6 total length 50.1 m			3	42.4			
T6low	240317.391	1079242.701	2	46.8	4	37.8									
T6 total length 50.1 m			5	30.8	5	30.8									
			6	23.4	6	23.4									
			7	17.4	7	17.4									
			8	11.5	8	11.5									
			9	5.8	9	5.8									
			10	0.7	10	0.7									
			T7west	240359.023	1079164.397	1	26.7				T7 total length 27.3 m			3	11.8
			T7east	240397.675	1079243.907	2	21.9							4	6.7
T7 total length 27.3 m			5	0.7											

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**APPENDIX B  
VEGETATION FIELD DATA**

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## 2006 Bar Beach Vegetative Cover Data

Restoration Site	Transect 1					Transect 2					Transect 3					Transect 4					Transect 5					Transect 6										Transect 7									
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5					
Quadrat	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
<i>Spartina alterniflora</i>	10	10	95	100	55	0	5	100	100	90	0	45	100	95	80	0	0	60	80	10	0	45	95	90	90	0	5	85	100	100	90	70	60	95	95	100	75	95	100	95					
<i>Spartina patens</i>	5	0	0	0	0	20	0	0	0	0	30	10	0	0	0	0	70	0	0	0	20	0	0	0	0	10	35	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Distichlis spicata</i>	55	90	0	0	0	45	90	0	0	0	20	45	0	0	0	75	30	0	0	0	40	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Salicornia europaea</i>	0	0	0	0	0	0	5	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Atriplex patula</i>	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	+	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Sueda linearis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Baccharis halimifolia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Iva frutescens</i>	10	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	60	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Phragmites australis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Panicum amarum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Solidago semipervirens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Sagina procumbens</i>	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Parthenocissus cinquefolia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
% dead vegetation	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
% open/mud/water	20	0	5	0	45	20	0	0	0	10	0	0	0	5	20	10	0	40	20	90	0	5	5	10	10	0	0	15	0	0	10	30	40	5	5	0	25	5	0	5					
% vegetative ground cover	80	100	95	100	55	65	100	100	100	90	100	100	100	95	80	80	100	60	80	10	100	95	95	90	90	100	100	85	100	100	90	70	60	95	95	100	75	95	100	95					

Reference Site	Transect 8			Transect 9				Transect 10		
Quadrat	1	2	3	1	2	3	4	1	2	3
<i>Spartina alterniflora</i>	0	85	90	0	30	100	50	95	80	55
<i>Spartina patens</i>	0	0	0	0	0	0	0	0	0	0
<i>Distichlis spicata</i>	0	0	0	0	0	0	0	0	0	0
<i>Salicornia europaea</i>	0	0	0	0	0	0	0	0	0	0
<i>Atriplex patula</i>	0	0	0	0	0	0	0	0	0	0
<i>Sueda linearis</i>	0	0	0	0	0	0	0	0	0	0
<i>Baccharis halimifolia</i>	0	0	0	0	0	0	0	0	0	0
<i>Iva frutescens</i>	70	0	0	0	0	0	0	0	0	0
<i>Phragmites australis</i>	10	0	0	80	50	0	0	0	0	0
<i>Panicum amarum</i>	0	0	0	0	0	0	0	0	0	0
<i>Solidago semipervirens</i>	0	0	0	0	0	0	0	0	0	0
<i>Sagina procumbens</i>	0	0	0	0	0	0	0	0	0	0
<i>Parthenocissus cinquefolia</i>	0	0	0	5	0	0	0	0	0	0
% dead vegetation	0	0	0	0	0	0	0	0	0	0
% open/mud/water	20	15	10	15	20	0	50	5	20	45
% vegetative ground cover	80	85	90	85	80	100	50	95	80	55

+ = present, but covers less than 1 percent of quadrat

## 2006 Bar Beach *Spartina alterniflora* height (in centimeters)

### Restoration Site

Quadrat

Transect 1					Transect 2					Transect 3					Transect 4					Transect 5					Transect 6										Transect 7					
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	
56	<b>76</b>	<b>130</b>	<b>128</b>	111		<b>61</b>	<b>116</b>	<b>142</b>	<b>113</b>		<b>94</b>	<b>148</b>	<b>118</b>	<b>74</b>		<b>31</b>	<b>91</b>	<b>139</b>	<b>145</b>		<b>83</b>	<b>151</b>	<b>140</b>	<b>159</b>		<b>178</b>	<b>101</b>	<b>144</b>	<b>124</b>	<b>67</b>	<b>16</b>	<b>43</b>	<b>154</b>	<b>51</b>	<b>187</b>	<b>135</b>	<b>122</b>	<b>105</b>	<b>123</b>	
32	<b>158</b>	<b>94</b>	<b>140</b>	<b>80</b>		<b>56</b>	<b>140</b>	<b>121</b>	<b>129</b>		<b>81</b>	<b>154</b>	<b>97</b>	<b>137</b>			<b>24</b>	<b>136</b>	<b>34</b>		<b>121</b>	<b>114</b>	<b>139</b>	<b>151</b>		<b>113</b>	<b>74</b>	<b>131</b>	<b>103</b>	<b>92</b>	<b>32</b>	<b>96</b>	<b>121</b>	<b>100</b>	<b>160</b>	<b>149</b>	<b>113</b>	<b>120</b>	<b>142</b>	
29	<b>166</b>	<b>76</b>	<b>137</b>	<b>149</b>		<b>28</b>	<b>130</b>	<b>135</b>	<b>27</b>		<b>76</b>	<b>158</b>	<b>149</b>	<b>33</b>			<b>21</b>	<b>183</b>	<b>15</b>		<b>147</b>	<b>121</b>	<b>150</b>	<b>183</b>		<b>98</b>	<b>71</b>	<b>147</b>	<b>106</b>	<b>80</b>	<b>14</b>	<b>11</b>	<b>178</b>	<b>104</b>	<b>193</b>	<b>181</b>	<b>112</b>	<b>121</b>	<b>142</b>	
37	<b>120</b>	<b>91</b>	<b>164</b>	<b>107</b>		<b>65</b>	<b>132</b>	<b>148</b>	<b>109</b>		<b>82</b>	<b>126</b>	<b>139</b>	<b>114</b>			<b>29</b>	<b>121</b>	<b>37</b>		<b>113</b>	<b>86</b>	<b>157</b>	<b>186</b>		<b>77</b>	<b>31</b>	<b>150</b>	<b>114</b>	<b>18</b>	<b>33</b>	<b>85</b>	<b>187</b>	<b>79</b>	<b>167</b>	<b>134</b>	<b>95</b>	<b>116</b>	<b>189</b>	
36	<b>60</b>	<b>79</b>	<b>159</b>	<b>87</b>		<b>56</b>	<b>125</b>	<b>174</b>	<b>131</b>		<b>103</b>	<b>150</b>	<b>159</b>	<b>67</b>			<b>42</b>	<b>125</b>	<b>20</b>		<b>87</b>	<b>106</b>	<b>128</b>	<b>191</b>		<b>100</b>	<b>84</b>	<b>182</b>	<b>123</b>	<b>73</b>	<b>81</b>	<b>9</b>	<b>126</b>	<b>129</b>	<b>192</b>	<b>152</b>	<b>75</b>	<b>115</b>	<b>132</b>	
57		<b>101</b>	<b>141</b>	<b>143</b>		<b>60</b>	<b>121</b>	<b>167</b>	<b>150</b>		<b>104</b>	<b>163</b>	<b>123</b>	<b>137</b>			<b>32</b>	<b>118</b>	<b>72</b>		<b>123</b>	<b>115</b>	<b>139</b>	<b>179</b>			<b>99</b>	<b>161</b>	<b>149</b>	<b>69</b>	<b>36</b>	<b>52</b>	<b>44</b>	<b>158</b>	<b>203</b>	<b>112</b>	<b>79</b>	<b>96</b>	<b>55</b>	
34		<b>80</b>	<b>149</b>	<b>114</b>			<b>139</b>	<b>173</b>	<b>138</b>		<b>93</b>	<b>169</b>	<b>146</b>	<b>121</b>			<b>43</b>	<b>163</b>	<b>99</b>		<b>99</b>	<b>103</b>	<b>191</b>	<b>159</b>			<b>111</b>	<b>162</b>	<b>127</b>	<b>47</b>	<b>88</b>	<b>102</b>	<b>31</b>	<b>161</b>	<b>206</b>	<b>187</b>	<b>115</b>	<b>121</b>	<b>118</b>	
36		<b>102</b>	<b>139</b>	<b>40</b>			<b>65</b>	<b>104</b>	<b>119</b>		<b>87</b>	<b>152</b>	<b>124</b>	<b>147</b>				<b>76</b>	<b>164</b>	<b>82</b>		<b>123</b>	<b>83</b>	<b>135</b>	<b>123</b>			<b>95</b>	<b>109</b>	<b>142</b>	<b>144</b>	<b>60</b>	<b>16</b>	<b>188</b>	<b>160</b>	<b>94</b>	<b>92</b>	<b>75</b>	<b>144</b>	<b>133</b>
46		<b>81</b>	<b>163</b>	<b>77</b>			<b>79</b>	<b>106</b>	<b>145</b>		<b>83</b>	<b>170</b>	<b>128</b>	<b>144</b>				<b>68</b>	<b>152</b>	<b>46</b>		<b>82</b>	<b>113</b>	<b>164</b>	<b>114</b>			<b>113</b>	<b>155</b>	<b>83</b>	<b>81</b>	<b>79</b>	<b>13</b>	<b>103</b>	<b>142</b>	<b>179</b>	<b>190</b>	<b>62</b>	<b>101</b>	<b>188</b>
		<b>93</b>	<b>160</b>	<b>98</b>			<b>104</b>	<b>119</b>	<b>75</b>		<b>87</b>	<b>132</b>	<b>133</b>	<b>115</b>				<b>68</b>	<b>166</b>	<b>185</b>		<b>70</b>	<b>119</b>	<b>130</b>	<b>110</b>			<b>75</b>	<b>188</b>	<b>87</b>	<b>82</b>	<b>56</b>	<b>13</b>	<b>175</b>	<b>146</b>	<b>199</b>	<b>137</b>	<b>110</b>	<b>135</b>	<b>145</b>
		<b>100</b>	<b>146</b>	<b>94</b>			<b>113</b>	<b>126</b>	<b>128</b>		<b>97</b>	<b>140</b>	<b>160</b>	<b>157</b>				<b>105</b>	<b>143</b>	<b>13</b>		<b>140</b>	<b>98</b>	<b>131</b>	<b>24</b>			<b>122</b>	<b>117</b>	<b>90</b>	<b>103</b>	<b>59</b>	<b>10</b>	<b>114</b>	<b>173</b>	<b>181</b>	<b>163</b>	<b>111</b>	<b>138</b>	<b>149</b>
		<b>130</b>	<b>140</b>	<b>102</b>			<b>120</b>	<b>137</b>	<b>137</b>		<b>82</b>	<b>158</b>	<b>178</b>	<b>152</b>				<b>82</b>	<b>153</b>	<b>16</b>		<b>102</b>	<b>95</b>	<b>127</b>	<b>17</b>			<b>128</b>	<b>152</b>	<b>90</b>	<b>72</b>	<b>66</b>	<b>62</b>	<b>160</b>	<b>181</b>	<b>152</b>	<b>220</b>	<b>147</b>	<b>137</b>	<b>194</b>
		<b>113</b>	<b>136</b>	<b>116</b>			<b>143</b>	<b>133</b>	<b>106</b>		<b>123</b>	<b>172</b>	<b>183</b>	<b>147</b>				<b>126</b>	<b>49</b>	<b>12</b>		<b>156</b>	<b>107</b>	<b>156</b>	<b>126</b>			<b>183</b>	<b>111</b>	<b>95</b>	<b>76</b>	<b>45</b>	<b>18</b>	<b>110</b>	<b>144</b>	<b>181</b>	<b>37</b>	<b>97</b>	<b>114</b>	<b>155</b>
		<b>86</b>	<b>148</b>	<b>103</b>			<b>133</b>	<b>139</b>	<b>83</b>		<b>111</b>	<b>206</b>	<b>154</b>	<b>143</b>				<b>96</b>	<b>70</b>	<b>70</b>		<b>136</b>	<b>117</b>	<b>129</b>	<b>167</b>			<b>97</b>	<b>164</b>	<b>81</b>	<b>79</b>	<b>19</b>	<b>117</b>	<b>144</b>	<b>202</b>	<b>192</b>	<b>34</b>	<b>96</b>	<b>119</b>	<b>150</b>
		<b>104</b>	<b>150</b>	<b>131</b>			<b>91</b>	<b>157</b>	<b>61</b>		<b>109</b>	<b>139</b>	<b>184</b>	<b>86</b>				<b>91</b>	<b>25</b>	<b>148</b>		<b>161</b>	<b>127</b>	<b>141</b>	<b>151</b>			<b>104</b>	<b>130</b>	<b>134</b>	<b>119</b>	<b>28</b>	<b>42</b>	<b>134</b>	<b>183</b>	<b>190</b>	<b>16</b>	<b>118</b>	<b>93</b>	<b>86</b>
		<b>172</b>	<b>154</b>	<b>102</b>			<b>101</b>	<b>157</b>	<b>82</b>		<b>113</b>	<b>144</b>	<b>177</b>	<b>64</b>				<b>65</b>	<b>55</b>	<b>173</b>		<b>104</b>	<b>101</b>	<b>106</b>	<b>206</b>			<b>113</b>	<b>141</b>	<b>134</b>	<b>122</b>	<b>33</b>	<b>43</b>	<b>175</b>	<b>128</b>	<b>65</b>	<b>153</b>	<b>107</b>	<b>102</b>	<b>95</b>
		<b>112</b>	<b>169</b>	<b>60</b>			<b>89</b>	<b>162</b>	<b>144</b>		<b>115</b>	<b>118</b>	<b>170</b>	<b>145</b>				<b>98</b>	<b>161</b>	<b>86</b>		<b>126</b>	<b>112</b>	<b>116</b>	<b>187</b>			<b>105</b>	<b>159</b>	<b>116</b>	<b>106</b>	<b>45</b>	<b>52</b>	<b>164</b>	<b>129</b>	<b>54</b>	<b>175</b>	<b>113</b>	<b>112</b>	<b>156</b>
		<b>82</b>	<b>171</b>	<b>63</b>			<b>122</b>	<b>169</b>	<b>119</b>		<b>138</b>	<b>138</b>	<b>169</b>	<b>142</b>				<b>78</b>	<b>175</b>			<b>99</b>	<b>85</b>	<b>135</b>	<b>42</b>			<b>90</b>	<b>53</b>	<b>132</b>	<b>103</b>	<b>26</b>	<b>40</b>	<b>124</b>	<b>62</b>	<b>134</b>	<b>199</b>	<b>114</b>	<b>116</b>	<b>107</b>
		<b>103</b>	<b>178</b>	<b>132</b>			<b>118</b>	<b>137</b>	<b>144</b>		<b>120</b>	<b>162</b>	<b>168</b>	<b>139</b>				<b>74</b>	<b>179</b>			<b>85</b>	<b>68</b>	<b>97</b>	<b>183</b>			<b>104</b>	<b>35</b>	<b>77</b>	<b>112</b>	<b>55</b>	<b>61</b>	<b>126</b>	<b>133</b>	<b>192</b>	<b>120</b>	<b>145</b>	<b>123</b>	<b>184</b>
		<b>100</b>	<b>161</b>	<b>127</b>			<b>66</b>	<b>134</b>	<b>137</b>		<b>128</b>	<b>156</b>	<b>208</b>	<b>142</b>				<b>75</b>	<b>142</b>			<b>122</b>	<b>93</b>	<b>100</b>	<b>196</b>			<b>114</b>	<b>7</b>	<b>48</b>	<b>130</b>	<b>57</b>	<b>31</b>	<b>159</b>	<b>126</b>	<b>131</b>	<b>164</b>	<b>111</b>	<b>25</b>	<b>152</b>

### Reference Site

Quadrat

Transect 8			Transect 9				Transect 10		
1	2	3	1	2	3	4	1	2	3
	<b>203</b>	<b>126</b>		<b>57</b>	<b>123</b>	<b>23</b>	<b>85</b>	<b>128</b>	<b>161</b>
	<b>145</b>	<b>105</b>		<b>56</b>	<b>146</b>	<b>16</b>	<b>117</b>	<b>116</b>	<b>143</b>
	<b>147</b>	<b>42</b>		<b>41</b>	<b>149</b>	<b>48</b>	<b>94</b>	<b>131</b>	<b>26</b>
	<b>136</b>	<b>14</b>		<b>42</b>	<b>129</b>	<b>132</b>	<b>78</b>	<b>188</b>	<b>95</b>
	<b>123</b>	<b>19</b>		<b>37</b>	<b>123</b>	<b>49</b>	<b>80</b>	<b>106</b>	<b>155</b>
	<b>120</b>	<b>68</b>		<b>43</b>	<b>172</b>	<b>34</b>	<b>71</b>	<b>119</b>	<b>136</b>
	<b>109</b>	<b>71</b>		<b>44</b>	<b>116</b>	<b>35</b>	<b>87</b>	<b>112</b>	<b>120</b>
	<b>106</b>	<b>119</b>		<b>61</b>	<b>155</b>	<b>84</b>	<b>147</b>	<b>152</b>	<b>128</b>
	<b>139</b>	<b>168</b>		<b>94</b>	<b>157</b>	<b>81</b>	<b>95</b>	<b>188</b>	<b>169</b>
	<b>128</b>	<b>146</b>		<b>81</b>	<b>178</b>	<b>104</b>	<b>104</b>	<b>196</b>	<b>158</b>
	<b>145</b>	<b>148</b>		<b>61</b>	<b>163</b>	<b>66</b>	<b>149</b>	<b>160</b>	<b>160</b>
	<b>124</b>	<b>153</b>		<b>64</b>	<b>176</b>	<b>110</b>	<b>106</b>	<b>170</b>	<b>143</b>
	<b>128</b>	<b>157</b>		<b>27</b>	<b>164</b>	<b>106</b>	<b>122</b>	<b>135</b>	<b>104</b>
	<b>142</b>	<b>139</b>		<b>75</b>	<b>161</b>	<b>22</b>	<b>87</b>	<b>149</b>	<b>85</b>
	<b>151</b>	<b>117</b>		<b>64</b>	<b>163</b>	<b>21</b>	<b>88</b>	<b>103</b>	<b>32</b>
	<b>46</b>	<b>116</b>		<b>36</b>	<b>124</b>	<b>29</b>	<b>83</b>	<b>84</b>	<b>126</b>
	<b>63</b>	<b>132</b>		<b>58</b>	<b>150</b>	<b>128</b>	<b>112</b>	<b>82</b>	<b>128</b>
	<b>138</b>	<b>152</b>		<b>54</b>	<b>105</b>	<b>135</b>	<b>107</b>	<b>131</b>	<b>106</b>
	<b>102</b>	<b>139</b>		<b>63</b>	<b>139</b>	<b>68</b>	<b>150</b>	<b>121</b>	<b>80</b>
	<b>201</b>	<b>145</b>		<b>45</b>	<b>131</b>	<b>13</b>	<b>154</b>	<b>142</b>	<b>68</b>

Measurements in bold font represent flowering plants

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**APPENDIX C  
SITE PHOTOGRAPHS**

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**Restoration site-view of transect 1 from upland end.**



**Restoration site-view of transect 2 from upland end.**



**Restoration site-view of transect 3 from upland end.**



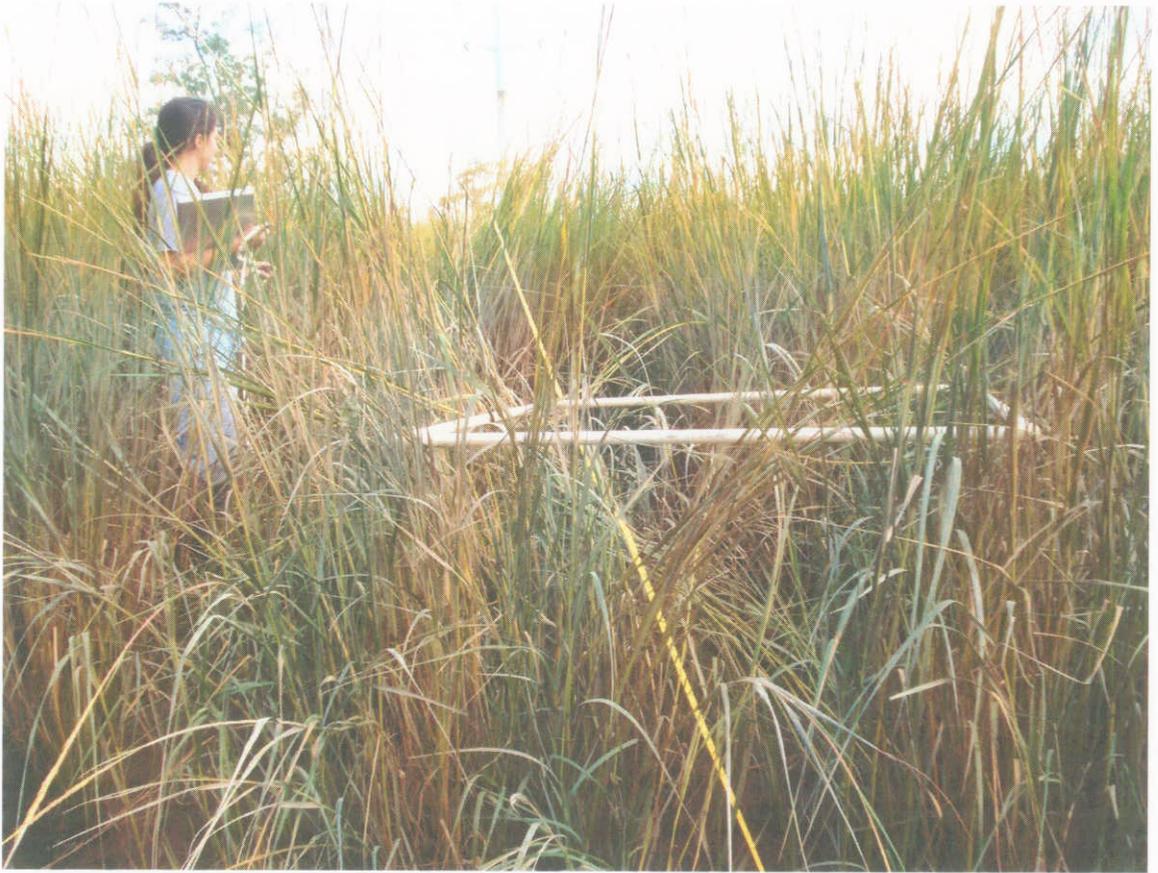
**Restoration site-view of transect 4 from upland end.**



**Restoration site-view of transect 5 from upland end.**



**Restoration site-view of transect 6 from upland end.**



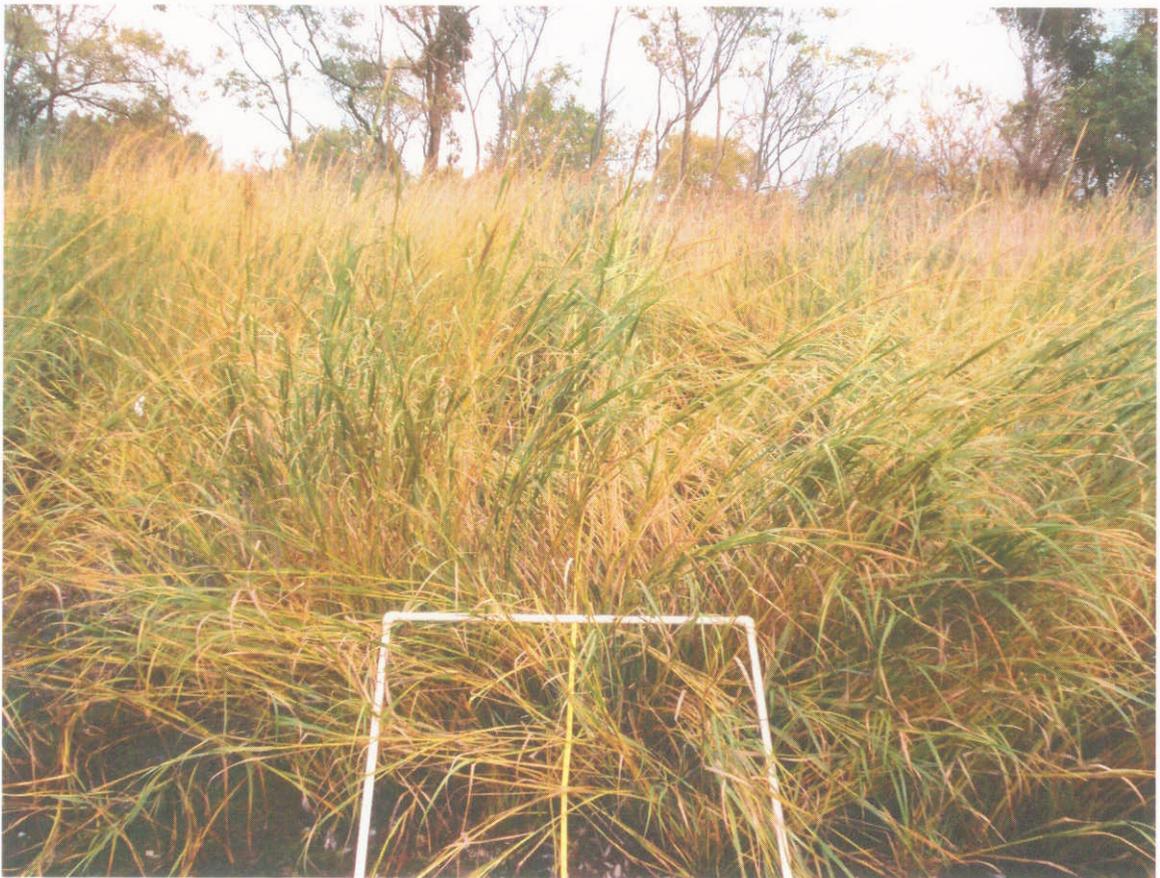
**Restoration site-view of transect 7 from west end.**



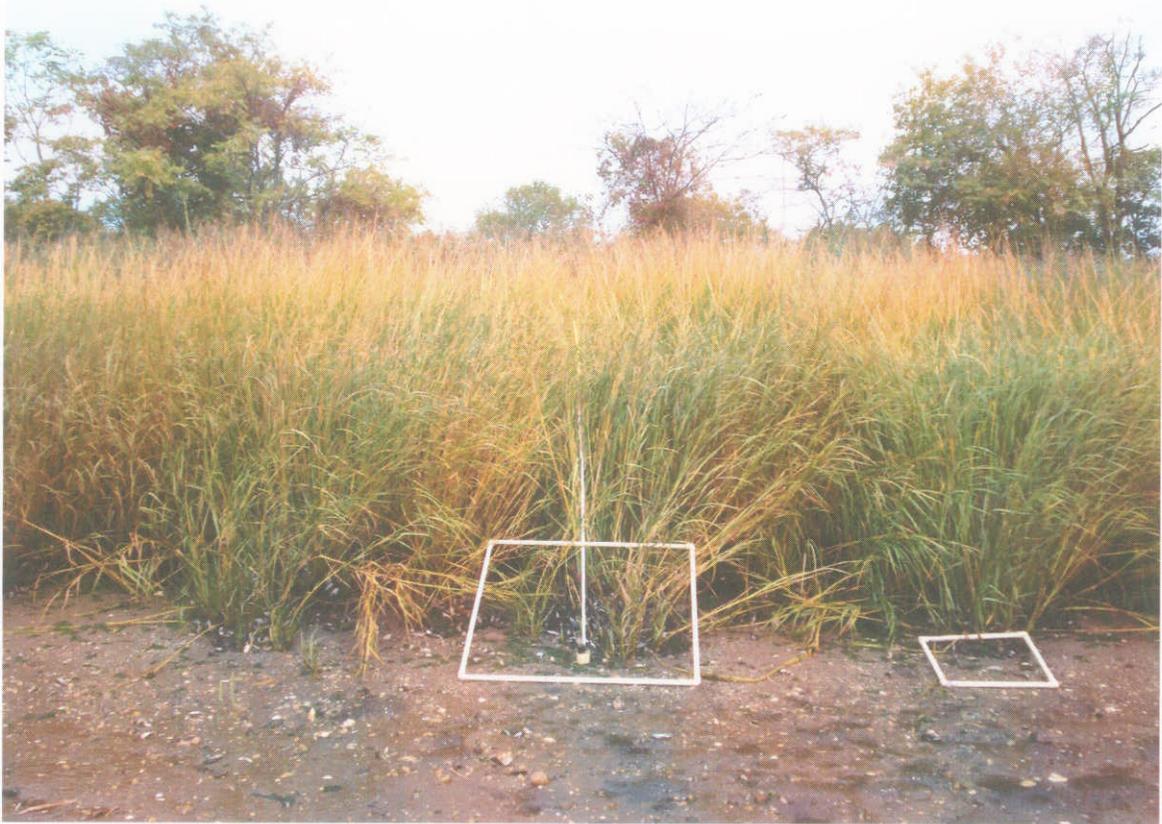
**Restoration site-view from boat ramp.**



**Reference site, view from boat ramp.**



**Reference site-view of transect 10.**



**Reference site-view of transect 9.**



**Reference site-view of transect 8.**



**Horseshoe crab excavations on peninsula at restoration site, May 2006.**



**Paired horseshoe crabs on peninsula at restoration site, May 2006.**

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**APPENDIX D**  
**NEKTON FIELD DATA**

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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, near T4, high marsh	5/24/06	40	9:35 AM	10:49 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Palaemonetes sp.</i>	
Total Caught	0	0	0	9	
Length (mm)	21				
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
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105					
106					
107					
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109					

Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, on T5, high marsh	5/24/06	25	9:35 AM	10:41 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Palaemonetes sp.</i>	
Total Caught	3	0	0	5	
Length (mm)	21				
22					
23					
24					
25					
26					
27					
28					
29					
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31					
32					
33					
34					
35					
36					
37					
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39					
40					
41					
42					
43	1				
44					
45					
46	1				
47					
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51	1				
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99					
100					
101					
102					
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105					
106					
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108					
109					

Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, between T6 and T5 high marsh	5/24/06	40	9:35 AM	10:32 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paoleomonetes sp.</i>	
Total Caught	0	0	0	9	
Length (mm)	21				
22					
23					
24					
25					
26					
27					
28					
29					
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31					
32					
33					
34					
35					
36					
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, between T4 and T5, low marsh	5/24/06	65	9:35 AM	11:19 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Palaemonetes sp.</i>	
Total Caught	1	0	0	35	
Length (mm)	21				
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23					
24					
25					
26					
27					
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, near T5, low marsh edge	5/24/06	75	9:35 AM	11:26 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paieomonetes sp.</i>	
Total Caught	0	0	0	27	
Length (mm) 21					
22					
23					
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32					
33					
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, near T3, low marsh	5/24/06	50	9:35 AM	11:09 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Palaemonetes sp.</i>	
Total Caught	0	0	0	32	
Length (mm)	21				
	22				
	23				
	24				
	25				
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, between T1 and T2, low marsh edge	5/24/06	45	9:35 AM	10:55 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paeleomonetes sp.</i>	
<b>Total Caught</b>	0	0	0	7	
Length (mm)	21				
	22				
	23				
	24				
	25				
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	27				
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	29				
	30				
	31				
	32				
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, peninsula T6, outer	5/24/06	27	9:35 AM	10:13 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paeleomonetes sp.</i>	
Total Caught	0	0	0	3	
Length (mm)	21				
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33					
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration peninsula on TG inner end	5/24/06	25	9:35 AM	9:50 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Palaemonetes sp.</i>	
Total Caught	0	1	0	5	
Length (mm)	21				
22					
23					
24					
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27					
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33					
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration, peninsula T7	5/24/06	33	9:35 AM	9:58 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Palaemonetes sp.</i>	
Total Caught	1	0	0	21	
Length (mm)					
21					
22					
23					
24					
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference, near T8, low marsh	5/24/08	32	9:35 AM	12:06 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paieomonetes sp.</i>	<i>Carcinus maenas</i>
Total Caught	0	0	0	3	1
Length (mm)	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference between T8 and T9 low marsh	5/24/06	50	9:35 AM	12:19 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paoleomonetes sp.</i>	<i>Carcinus maenas</i>
Total Caught	0	0	0	63	1
Length (mm)	21				
	22				
	23				
	24				
	25				
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	27				
	28				
	29				
	30				
	31				
	32				
	33				
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference between T8 and T9 mid marsh	5/24/06	38	9:35 AM	11:54 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Pauleomonetes sp.</i>	
Total Caught	0	0	0	2	
Length (mm)	21				
	22				
	23				
	24				
	25				
	26				
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	30				
	31				
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference between T9 and T10 mid marsh	5/24/06	45	9:35 AM	11:44 AM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paeleomonetes sp.</i>	
Total Caught	0	0	0	5	
Length (mm)	21				
	22				
	23				
	24				
	25				
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	27				
	28				
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	30				
	31				
	32				
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Spring 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference between T9 and T10 low marsh	5/24/06	30	9:35 AM	12:28 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Paiecomonetes sp.</i>	
Total Caught	0	0	0	2	
Length (mm)	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
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Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, near T5	9/28/06	70	2:57 PM	2:40 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp</i>
Total Caught	6	1	0	0	12
Length (mm)					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31	1				
32					
33					
34					
35					
36					
37					
38					
39					
40	1				
41	2				
42					
43					
44					
45					
46	1				
47					
48					
49					
50					
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53					
54					
55					
56	1				
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83					
84		1			
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105					
106					
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Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, peninsula	9/28/06	60	2:57 PM	2:50 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp.</i>
Total Caught	1	0	1	0	10
Length (mm)	21				
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
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35					
36					
37					
38	1				
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105					
106					
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Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, on peninsula	9/28/06	60	2:57 PM	3:00 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp.</i>
Total Caught	3	3	0	0	9
Length (mm)					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39	1	1			
40					
41					
42					
43					
44					
45	1	1			
46	1				
47					
48					
49					
50					
51					
52					
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73					
74					
75					
76					
77		1			
78					
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Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, on peninsula	9/28/06	56	2:57 PM	3:10 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Paellaomonetes sp.</i>
<b>Total Caught</b>	1	0	0	0	7
Length (mm)	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				
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	109				

Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, between T4 and T5	9/28/06	70	2:57 PM	3:20 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp.</i>
Total Caught	2	0	0	0	0
Length (mm)					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31	1				
32					
33					
34					
35					
36					
37					
38					
39					
40	1				
41					
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43					
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Data	Restoration site, near T4	9/28/06	70	2:57 PM	3:30 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp.</i>
Total Caught	2	1	0	0	21
Length (mm)					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35	1				
36					
37		1			
38					
39					
40					
41					
42					
43					
44					
45					
46					
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51	1				
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Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, between T3 and T4	9/28/06	45	2.57 PM	3:40 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes</i> sp.
Total Caught	12	8	0	0	0
Length (mm)	21				
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32	1				
33					
34					
35	1				
36					
37					
38	1				
39	1				
40	3	1			
41	1				
42					
43					
44	1				
45	1	1			
46					
47		1			
48					
49					
50	1	1			
51					
52		1			
53					
54	1				
55					
56					
57					
58		1			
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73					
74		1			
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79		1			
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107					
108					
109					

Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, near T3	9/28/06	60	2:57 PM	4:00 PM
<b>Species</b>	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp.</i>
<b>Total Caught</b>	5	0	0	0	20
Length (mm)	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33	1			
	34				
	35				
	36				
	37	1			
	38				
	39	1			
	40				
	41				
	42	1			
	43				
	44				
	45				
	46				
	47	1			
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	106				
	107				
	108				
	109				

Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site, between T3 and T2	9/28/06	40	2:57 PM	4:10 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes</i> sp.
Total Caught	3	12	3	0	28
Length (mm)					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31	1				
32					
33					
34		1			
35		1			
36		1			
37					
38					
39	1				
40		1			
41		1			
42					
43					
44		1			
45	1				
46					
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50			1		
51		1			
52			1		
53			1		
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65		1			
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71		1			
72		1			
73		1			
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79		1			
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108					
109					

Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Restoration site on T2	9/28/08	40	2:57 PM	4:30 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Paedomones sp.</i>
Total Caught	4	5	0	0	15
Length (mm) 21					
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23					
24					
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31					
32					
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39					
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41					
42					
43		1			
44	1				
45	1				
46					
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48					
49		1			
50					
51		1			
52					
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56	1				
57					
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60					
61		1			
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73		1			
74	1				
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107					
108					
109					

Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference site, near T10	9/28/06	40	2:57 PM	4:45 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp.</i>
Total Caught	4	2	0	0	2
Length (mm)	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35	1			
	36	1	1		
	37		1		
	38	1			
	39				
	40	1			
	41				
	42				
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	44				
	45				
	46				
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	106				
	107				
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	109				

Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference site, near T10	9/28/06	30	2:57 PM	4:55 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes</i> sp.
Total Caught	1	1	0	1	0
Length (mm)	21				
22					
23					
24					
25					
26					
27					
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31					
32					
33					
34					
35					
36					
37				1	
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43					
44		1			
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96	1				
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109					

Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference site between T10 and T9	9/28/06	25	2:57 PM	5:00 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes</i> sp.
Total Caught	2	0	0	0	
Length (mm)	21				
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38	1				
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49	1				
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Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference site, near T9	9/28/06	30	2:57 PM	5:05 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Pauleomonetes sp.</i>
Total Caught	2	2	0	0	4
Length (mm)	21				
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37		1			
38		1			
39					
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42	1				
43					
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46					
47	1				
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Fall 2006 Fish Data	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
	Reference site, nsar T9	9/28/06	60	2:57 PM	5:12 PM
Species	<i>Fundulus heteroclitus</i>	<i>Fundulus majalis</i>	<i>Menidia menidia</i>	<i>Cyprinodon variegatus</i>	<i>Palaemonetes sp.</i>
Total Caught	1	0	0	0	1
Length (mm)	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				
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**APPENDIX E**  
**BENTHIC MACROINVERTEBRATE FIELD DATA**

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**APPENDIX F**  
**AVIAN FIELD DATA**

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MONITORING INFORMATION

Date of Monitoring 12/8/05

Time of Monitoring Began: 9:30 AM  
Concluded: 10 AM

Tide (please circle one) High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather 27° NW @ 5-10 clear  
(temperature, wind, precipitation)

Monitor(s) (name, affiliation) M. NORMANDIA, NSAS

Type of Monitoring (please circle one) Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 2 / 3 / 4 / 5

Parameters Measured (please circle all that apply) Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted? Yes No  
(please indicate station codes)

Video Monitoring Conducted? Yes No  
(please provide brief description)



MONITORING INFORMATION

Date of Monitoring

12/12/05

Time of Monitoring

Began: 9:30 AM

Concluded: 10: AM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

31° WNW @ 10 cloudy

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



MONITORING INFORMATION

Date of Monitoring

12/21/05

Time of Monitoring

Began: 9:45 AM

Concluded: 10:15 AM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

35° NW @ 5-10 Clear

(temperature, wind, precipitation)

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 / 2 / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring 12/30/05

Time of Monitoring

Began: 10 AM

Concluded: 10:30

Tide  
(please circle one)

Very High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

40° NW @ 18-25 Sunny

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



MONITORING INFORMATION

Date of Monitoring

1-7-06

Time of Monitoring

Began: 2pm

Concluded: 2:30 pm

Tide

(please circle one)

High Tide / Ebbing  Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

39°/5-7mph/sunny

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1  2 / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes  No

Video Monitoring Conducted?

(please provide brief description)

Yes  No



MONITORING INFORMATION

Date of Monitoring 1-10-06

Time of Monitoring

Began: 9:30 AM  
Concluded: 10:00 AM

Tide  
(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

42° / 5-10 mph WNW Sunny

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 2 / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring

1/19/06

Time of Monitoring

Began: 1:30

Concluded: 2 PM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

48° / W direction / 60% cloud coverage

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 2 / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring

1/22/06

Time of Monitoring

Began: 8:45 AM

Concluded: 9:30 AM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

35° N @ 5-10, Clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



MONITORING INFORMATION

Date of Monitoring 2/3/06

Time of Monitoring

Began: 4 PM  
Concluded: 4:30 PM

Tide  
(please circle one)

High Tide /  Ebbing /  Low Tide /  Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather  
(temperature, wind, precipitation)

52° SSW CLEAR

Monitor(s)  
(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring  
(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1  2 /  3 /  4 /  5

Parameters Measured  
(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?  
(please indicate station codes)

Yes  No

Video Monitoring Conducted?  
(please provide brief description)

Yes  No



MONITORING INFORMATION

Date of Monitoring

2/7/06

Time of Monitoring

Began: 9:30 AM

Concluded: 10: AM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

37° WNW @ 10 / Clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring

2/16/06

Time of Monitoring

Began: 11:30 AM

Concluded: 12 PM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

52° S@10 Clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring

3/7/06

Time of Monitoring

Began: 9:30 AM

Concluded: 10 AM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

40° NW @ 5 clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring 3/16/06

Time of Monitoring

Began: 9:30 A.M.

Concluded: 10:AM

Tide  
(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

40° NW @ 20, clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring 3/22/06

Time of Monitoring

Began: 12 pm

Concluded: 12:30 pm

Tide  
(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

45° @ 15-20 mph / NW clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No

MONITORING PARAMETERS: BIRD OBSERVATION

3/22/06

Site:

Species	Abundance	Location	Activity	Duration of Stay
<del>Ø</del>				
Mute Swan	2	water/mud	feeding	15 minutes
Mallard	2	" "	sleeping	15 minutes
Canada Geese	6	" "	wading	15 minutes
Ring billed Gull	1	" "	"	"

Ref:

Other bird Notes: 205 Canada Geese South Harbor

- 30 Starling
  - 40 Ring billed Gull
  - 32 Rock Pigeon
  - 45 Robin
- } Around parking Lot.

# MONITORING INFORMATION

Date of Monitoring

3/29/06

Time of Monitoring

Began: 12 pm

Concluded: 12:30 pm

Tide

(please circle one)

High Tide /  Ebbing /  Low Tide /  Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

51 NW @ 5 mph

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1  2 /  3 /  4 /  5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes  No

Video Monitoring Conducted?

(please provide brief description)

Yes  No



# MONITORING INFORMATION

Date of Monitoring

4/2/06

Time of Monitoring

Began: 3 PM

Concluded: 3:30 PM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

60 WNW @ 5-10 mph

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring

4/11/06

Time of Monitoring

Began: 9:30

Concluded: 10:00

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

50 WSW @ 5, clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No

MONITORING PARAMETERS: BIRD OBSERVATION

4/11/06

Site:

Species	Abundance	Location	Activity	Duration of Stay
Great Blue Heron	1	grass island	roosting	15 minutes
Canada Geese	10	Water	Swimming	15 minutes
Mockingbird	2	scrubbery	nesting	15 minutes
Belted Kingfisher	1	Flying over site	→	10 minutes

Ref:

Canada Geese	12	grasses	feeding	15 minutes
Mallard	2	grasses	feeding	10 minutes

Other bird notes: Harbor } 2 mallard  
 2 D.C. Cormorant

Parking Lot: 30 Canada Geese  
 22 Rock Pigeon  
 40 Starling  
 1 Savannah Sparrow  
 48 Ring billed Gull  
 Carolina Wren

1 Peregrine-hunting

# MONITORING INFORMATION

Date of Monitoring

4/19/06

Time of Monitoring

Began: 11AM

Concluded: 12AM

Tide

(please circle one)

High Tide / Ebbing  Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

60° N @ 15 clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1  2 / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes  No

Video Monitoring Conducted?

(please provide brief description)

Yes  No



MONITORING INFORMATION

Date of Monitoring

4/26/06

Time of Monitoring

Began: 12:00

Concluded: 12:30

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

56 N @ 5-10 clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (1) / 2 / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



MONITORING INFORMATION

Date of Monitoring

5/3/06

Time of Monitoring

Began: 9 AM

Concluded: 9:30 AM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

62° N @ 10 mph cloudy

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No

MONITORING PARAMETERS: BIRD OBSERVATION

5/3/06

Site:

Species	Abundance	Location	Activity	Duration of Stay
Savannah Sparrow	2	grasses	feeding	15 minutes
Mallard	2	mud	feeding	15 minutes
Mourning Dove	2	tidal island	"	"

Ref:

Ring-billed Gull	6	mud	standing	15 minutes
Eu. Starling	9	bank	flocking	10 minutes
Mallard	4	low water	swimming	5 minutes
Canada Geese	5	low water	"	"

Other bird Notes:

- 2 Plover (sp?)
- 1 Sandpiper (sp?)
- 1 Snowy Egret
- 1 Gr. Egret
- 16 Ring-billed Gull
- 1 Yellow Warbler
- 4 RW Blackbird
- 1 Peregrine - I.I.P.A.

South Cove

8 D.C. Cormorant  
 34 Canada Geese  
 8 Osprey

40 Starling  
 4 Robin  
 6 Canada Geese  
 20 Ring-billed Gull  
 12 Herring Gull  
 2 Fish Crow

Parking Lot

MONITORING INFORMATION

Date of Monitoring 5/8/06

Time of Monitoring

Began: 9 AM

Concluded: 9.30

Tide  
(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

59 E @ 15 cloudy

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



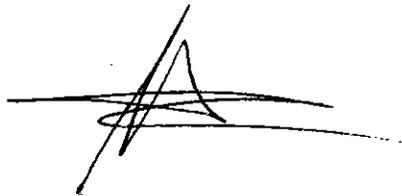
FIELD NOTES

5/13/06

---

Town to North Hempstead workers  
cut through large cable in  
Parking lot causing oil spill.

(The oil encased the cable for heating/cooling)  
Various devices were placed around  
harbor to contain spill. Parking lot  
was dug up and many trucks and  
environmental orgs. constantly in area  
(still - to st22). (May have effect on  
breeding birds, turtles, inverts, fishes)



No work on restoration of south cove  
noted to date.

MONITORING INFORMATION

Date of Monitoring 5/21/06

Time of Monitoring

Began: 12 PM

Concluded: 12:30 PM

Tide  
(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

60° W @ 10-20 cloudy

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



FIELD NOTES

6/27/06

---

Other than the emergency cable repair in parking lot, I have not seen anything resembling further restoration of this cove at Bar Beach.

I was signed on to monitor birds for another year (through Sept 06) with the understanding that more wetlands would be restored.

Would like update please.

Mary

516 671 4359

MONITORING INFORMATION

Date of Monitoring

5/29/06

Time of Monitoring

Began: 3pm

Concluded: 3:30

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

80° SE @ 0-5, hazy

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



MONITORING INFORMATION

Date of Monitoring 6/5/06

Time of Monitoring Began: 9:30 AM  
Concluded: 10 PM

Tide (please circle one) High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather (temperature, wind, precipitation) 70 W @ 5-10

Monitor(s) (name, affiliation) M. NORMANDIA, NSA S

Type of Monitoring (please circle one) Pre-Construction  
As-built (4-5 weeks)

Annual Post-Construction: Year 1 (1 2) / 3 / 4 / 5

Parameters Measured (please circle all that apply) Vegetation  
Sediment  
Benthic Invertebrates  
Birds  
Other (please describe):

Photo Monitoring Conducted? (please indicate station codes) Yes / No

Video Monitoring Conducted? (please provide brief description) Yes / No



MONITORING INFORMATION

Date of Monitoring

6/8/06

Time of Monitoring

Began: 5:30 pm

Concluded: 6:15 pm

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

66°, VA, cloudy

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes No

Video Monitoring Conducted?

(please provide brief description)

Yes No



MONITORING INFORMATION

Date of Monitoring

6/16/06

Time of Monitoring

Began: 9: AM

Concluded: 9:45 AM

Tide  
(please circle one)

High Tide / Ebbing / Very Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

75 NW @ 5 clear

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSA S

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No

Note:  
 - No ferruginous  
 - no horseshoe crabs (alive)

MONITORING PARAMETERS: BIRD OBSERVATION

6/16/06

Site:

Species	Abundance	Location	Activity	Duration of Stay
Am. Goldfinch	2	scrub	Feeding	10 minutes
BK. Crowsnight Heron (young)	1	mud	Feeding	15 minutes
Redwing Blackbird	2	perch on grass	sitting	5 minutes

Ref:

Canada goose	2 ad. 1 young	mud	sitting	15 minutes
Great Egret	1	mud	waiting	15 minutes
Mute Swan	3 ad. 3 young	mud	walking	10 minutes
Herring Gull	2	mud	eating dead fish	15 minutes

Other bird

Notes:  
 7 Mallard w/ 1 young  
 1 Mute Swan w/ 3 young  
 4 D.C. Cormorant  
 9 Osprey (unknown young)  
 1 Mockingbird  
 1 Yellow Warbler  
 1 Balt. Oriole  
 25 Great Egret  
 6 Great Blue Heron  
 2 Brown Noddy

Harbor

1 Fish Crow  
 16 Starling  
 1 House sparrow  
 11 Rock Pigeon

Park  
 Lot

1 adult 1 young  
 Peregrine Falcon

MONITORING INFORMATION

Date of Monitoring

6/19/06

Time of Monitoring

Began: 4pm

Concluded: 5pm

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

89° NSW @ 10-15 Cloudy

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring 6/27/06

Time of Monitoring Began: 9:15 AM  
Concluded: 9:45 AM

Tide (please circle one) High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:  
Time of tidal measurements:  
Nearest tidal station:

Weather (temperature, wind, precipitation) 75° SE @ 15 cloudy

Monitor(s) (name, affiliation) M. NORMANDIA, NSA S

Type of Monitoring (please circle one) Pre-Construction  
As-built (4-5 weeks)  
Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured (please circle all that apply) Vegetation  
Sediment  
Benthic Invertebrates  
Birds  
Other (please describe):

Photo Monitoring Conducted? (please indicate station codes) Yes / No

Video Monitoring Conducted? (please provide brief description) Yes / No



MONITORING INFORMATION

Date of Monitoring

7/7/06

Time of Monitoring

Began: 9:30AM

Concluded: 10:AM

Tide

(please circle one)

High Tide / Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather

(temperature, wind, precipitation)

75° NE @ 5-10 SUNNY

Monitor(s)

(name, affiliation)

M. NORMANDIA, NSAS

Type of Monitoring

(please circle one)

Pre-Construction

As-built (4-5 weeks)

Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured

(please circle all that apply)

Vegetation

Sediment

Benthic Invertebrates

Birds

Other (please describe):

Photo Monitoring Conducted?

(please indicate station codes)

Yes / No

Video Monitoring Conducted?

(please provide brief description)

Yes / No



MONITORING INFORMATION

Date of Monitoring 7/12/06

Time of Monitoring Began: 2:15 pm  
Concluded: 2:45 pm

Tide (please circle one) High Tide Ebbing / Low Tide / Flooding

Predicted low and high tides:

Time of tidal measurements:

Nearest tidal station:

Weather (temperature, wind, precipitation) 85° S @ 5 Hazy

Monitor(s) (name, affiliation) M. NORMANDIA, NSA S

Type of Monitoring (please circle one) Pre-Construction  
As-built (4-5 weeks)  
Annual Post-Construction: Year 1 (2) / 3 / 4 / 5

Parameters Measured (please circle all that apply) Vegetation  
Sediment  
Benthic Invertebrates  
Birds  
Other (please describe):

Photo Monitoring Conducted? (please indicate station codes) Yes No

Video Monitoring Conducted? (please provide brief description) Yes No





















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**APPENDIX G**  
**NOAA 2002 PRE-RESTORATION MONITORING DATA**

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NOAA 2002 Pre-Restoration Monitoring Data

Restoration Site																																														
Vegetative Cover (percent)																																														
Species	Transect 1						Transect 2						Transect 3						Transect 4						Transect 5						Transect 6						Transect 7						Average			
Plants	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q1	Q2	Q3	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q1	Q2	Q3	Q4	Q5	Q6	(square meter)
<i>Spartina alterniflora</i>	0	0	1	90	90	40	0	0	0	35	18	0	0.5	0	85	20	0	0	0	0	0	0	0	0	60	0	0	65	45	55	40	0	0	0	0	85	80	3.5	25	0	0	80	60	35	0.5	22.5%
<i>Phragmites australis</i>	37	7	0	0	0	0	45	0	1	0	0	0	7	0	0	0	0	15	20	30	20	25	5	37	0	5	100	0	0	0	0	100	100	70	0	0	0	0	15	15	0	0	0	0	0	14.5%
<i>Iva frutescens</i>	0	65	0	0	0	0	0	60	50	0	0	0	0	0	0	0	0	40	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.1%
<i>Distichlis spicata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14.1%
<i>Artemisia vulgaris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
<i>Limonium</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	47	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2%
<i>Toxicodendron radicans</i>	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7%
<i>Salicornia europaea</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total Plant Cover																																				46.6%										
Invertebrates	Macroinvertebrate density (individuals per square meter)																																			(1/4 square meter)										
<i>Geukensia demissa</i>	0	0	0	200	600	1500	0	0	0	0	180	140	10	0	0	120	15	69	0	0	0	0	0	1	150	0	0	54	67	40	78	0	0	0	5	67	42	92	0	0	0	39	105	1	19.9	
<i>Uca pugnax</i> (burrows)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
<i>Nassarius obsoletus</i>	0	0	0	0	0	0	0	0	0	0	90	240	410	0	0	240	130	312	0	0	0	0	0	0	0	0	0	87	400	100	420	0	0	0	15	120	31	60	0	0	0	218	352	128	18.6	

NOTE: These transects are not the same as those used in the 5 year post-construction monitoring program.

Reference Site														
Vegetative Cover (percent)														
Species	Reference 1													Average
Plants	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	(square meter)
<i>Spartina alterniflora</i>	88	25	95	32	55	85	100	100	90	100	50	45	12	67.5%
Invertebrates	Macroinvertebrate density (individuals per square meter)													(1/4 square meter)
<i>Geukensia demissa</i>	320	19	600	38	0	0	1400	1180	1310	1620	177	0	5	128.3
<i>Nassarius obsoletus</i>	0	30	0	0	1300	0	0	1000	1860	0	172	0	0	83.9

The reference site is not the same as the reference site used in the 5 year post-construction monitoring program.

<i>Spartina alterniflora</i> height (first number is feet, second number is inches)																								
Restoration Site																	Reference Site							
T1	T1	T2	T2	T3	T3	T4	T5	T5	T5	T5	T6	T6	T6	T7	T7	T7	T7	R1	R1	R1	R1	R1	R1	
Q4	Q5	Q4	Q5	Q2	Q3	Q8	Q3	Q4	Q5	Q6	Q4	Q5	Q7	Q3	Q4	Q5	Q6	Q1	Q3	Q5	Q7	Q9	Q11	
4.5	4	4.8	6.10	6	2.5	3	2.1	6	4.5	2	4	4	3.3	5.4	6	5.3	2.3	4.3	4	4.4	4.1	6	4.6	
4	3	3.11	6.9	4.5	3.25	3.5	2.5	6	2.5	1.5	3.1	2.65	2	4.9	5	4.3	4.4	5.8	4	3.10	5	6.7	4	
4	2.5	6.4	4.11	2	1.5	6	2.2	4.5	2	3	4.2	6	3	5.3	5.3	5		4	4.2	4.3	5.7	5.6	5.5	
2	3	5	6.4	4.25	2.5	4	4	3	2.1	2.2	4.5	2.6	3.1	4.6	6.10	4.5		3.5	4.7	3	5.1	5.3	5	
3	3	5.1	6.5	5.5	3	6	3	2	3	2	4.5	6	2.5	4.7	5.5	4.11		4.11	4	4.1	5.3	5	4.4	
4.5	4	4.6	4.4	5	3	4.5	2.5	2.2	4.5	3	5	3	3	4.10	5.9	5.6		3	3.11	4.4	5.6	6.5	5.5	
5	4.5	3.10	3.8	5.5	3.25	5.75	2.3	2.4	3.1	3.1	6	1.5	3.5	4.7	5.10	5.6		2.5	3.6	4.6	6.3	4.1	4	
4	3.5	4.6	2.10	2.5	2.5	4	4.6	2.5	3	3.5	3.2	4.5	1	5.2	6.3	4.8		5	4.5	4	6	5.4	4.7	
5.5	3.5	3.9	5.4	6.1	2.25	6.25	5	3	3	4	4.3	4	3.2	4.5	5.3	5.4		3.7	3.10	3.10	8	6.1	4.9	
3	5	4.6	6.1	5	1.75	3.5	3.2	1.6	2.1	3.7	5	4.2	1.5	4.2	5.5	5.3		4.6	4.5	6.1	5.10	3.7	4.2	
4.5	5	4.5	1.8	6.25	2.75	5.5	6	3	3.5	3.8	3.1	4	1.8	4.8	5.7	5.4		4.5	4.5	3	5.4	6	4.10	
4	4.5	4.6	1.5	5.2	2	5	5.2	5.5	3.8	3.6	4.5	3.5	1.6	4.5	4.10	4.10		3.4	4.2	4.1	5	5.3	4.10	
4	3	3.11	1.6	5.75	2.5	5	5	3	3.2	4	6	4.5	1.8	5.5	5.2	4.9		3.4	4.4	4.6	4.8	4.7	3.5	
4	4	3.7	3.7	6.5	2	3.25	5.5	3	2.2	4.1	5.8	4.2	1.9	5.4	4.8	4.9		4.7	3.10	3.4	6.3	5.11	5	
3	4	3.3	2.2	5.5	1.5	5.75	6.1	6	3	4.2	4.2	4.1	2	5.10	6.3	5		3.6	3.2	4.8	4.5	5.1	4.11	
4.5	4	3.2	0.83	4.5	2.5	5.5								2.8	5.15	5.4	4.9		3.10	3.5	3.7	3.5	4.7	5.1
4.5	6	3.2	1.4	6.5	1.75	3.5								3	5.1	5	4.10		4.10	4.11	3	5.2	6.2	4.4
4	3.5	2.4	0.91	6.25	2.25	3.75								1.7	5.15	5	4.7		4.5	3.7	4.5	5.3	5	5.5
5	3	3.2	0.83	6	3	4								6	5.15	5	4.7		4.3	4.4	4.3	4.2	6.4	4.11
4.5	3	4	4.9	5.25	2.5	5.5								1.7	5.1	4.10	4.9		4.10	4.1	5.5	5.9	5.5	

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Heights in bold font are flowering plants.