



Monitoring Salt Marsh Vegetation and Nekton at Assateague Island National Seashore

2012 Summary Report

Natural Resource Data Series NPS/NCBN/NRDS—2013/655



ON THE COVER

Salt Marsh at Assateague Island National Seashore.
Photograph by: Erika Nicosia

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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Abstract

The Northeast Coastal and Barrier Network (NCBN) began monitoring salt marsh vegetation and nekton at Assateague Island National Seashore (ASIS) in 2008. This report summarizes the third year of data collected at nine permanent monitoring sites during the summer of 2012. Monitoring will continue on a biennial basis.

Approximately fifty vegetation plots were sampled at each of the nine marsh sites (total = 451 plots). The percent cover of each vegetation species and non-vegetation cover type within each 1 m² plot was visually estimated using a revised Braun-Blanquet method. Fourteen vegetation species and four non-vegetation cover types (bare ground, water, wrack & litter, and trash) were recorded.

A total of 127 nekton stations were established on creeks and pools/pannes. Each station was sampled twice during the field season (except for at site 8, where only the late summer sampling was conducted). Nekton stations were sampled using a 1 m² aluminum throw trap. Eight species of nekton were recorded in 2012, including six fish, and two crab species. Common mummichog (*Fundulus heteroclitus*), sheepshead minnow (*Cyprinodon variegatus*), and rainwater killifish (*Lucania parva*) accounted for approximately 97% of all nekton captured in 2012.

Acknowledgments

We would like to thank Assateague Island National Seashore for providing housing and logistical support to the 2012 field crew.

Introduction

National Park Service (NPS) managers need accurate information about how, when and why natural systems change over time in order to make sound management decisions. To address this need, the NPS initiated natural resource monitoring through the Natural Resource Challenge. The Inventory and Monitoring Program (I&M), the key component of this effort, organizes 270 park units into 32 networks tasked with conducting long-term ‘vital signs’ monitoring (Fancy et al. 2009). Vital signs are defined as measurable, early warning signals that may indicate change in the long-term health of natural systems. Early detection of potential problems allows park managers to take steps in restoring or maintaining the ecological health of park resources.

The Northeast Coastal and Barrier Network (NCBN) consists of eight parks extending along the Northeast Atlantic Coast. Vital Signs chosen as part of the Network’s monitoring plan include salt marsh vegetation communities, nekton communities, essential estuarine water quality parameters, and specific coastal geomorphologic features (Stevens et al. 2005). Detailed monitoring protocols have been developed and implemented in the eight parks. This annual report summarizes salt marsh vegetation and nekton community data collected at Assateague Island National Seashore (ASIS) in 2012 according to two protocols—*Monitoring Nekton in Salt Marshes: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network* (James-Pirri et al. 2012) and *Monitoring Salt Marsh Vegetation: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network* (James-Pirri et al. In Review).

Methods

Permanent Site Selection

All salt marsh areas were identified and delineated into 5-8 hectare areas using a GIS. Nine permanent sites (established in 2008) were randomly selected for long-term vegetation and nekton monitoring (Fig. 1). The number of sites chosen was based on available habitat and the logistics and feasibility of sampling. Detailed information about the site selection process and sampling design can be found in the Salt Marsh Vegetation (James-Pirri et al. In Review) and Nekton Protocols (James-Pirri et al. 2012). Vegetation and nekton data collection at all nine sites began in 2008 and will continue on a biennial basis.

Nekton Sampling Station Selection and Data Collection

While monitoring sites remain permanent from year to year, nekton stations within each site are re-randomized each sampling year. All sampling stations were randomly established on the perimeter of pools or along the length of creeks (James-Pirri et al. 2012). Universal Transverse Mercator (UTM) coordinates for each station are provided in Appendix A. Nekton stations were sampled twice, once in early summer (mid- to late-June) and once in late summer (early-August) (Table 1).

Nekton in creeks or pools and flooded pannes were sampled using a 1 m² aluminum throw trap (Kushlan 1981, Sogard and Able 1991, Raposa and Roman 2001, James-Pirri et al. 2012). All nekton were collected from the trap using a 1 mm mesh dip net.

For each sampling station, all nekton that were captured in the throw trap were identified and enumerated. Lengths of fifteen haphazardly selected individuals of each species were measured (fish – total length; crabs – carapace width; shrimp – total length). Once identified and measured, all organisms were returned to the location where they were collected (outside the throw trap). Water temperature, depth, and salinity were recorded for each sampling station during each sampling event.

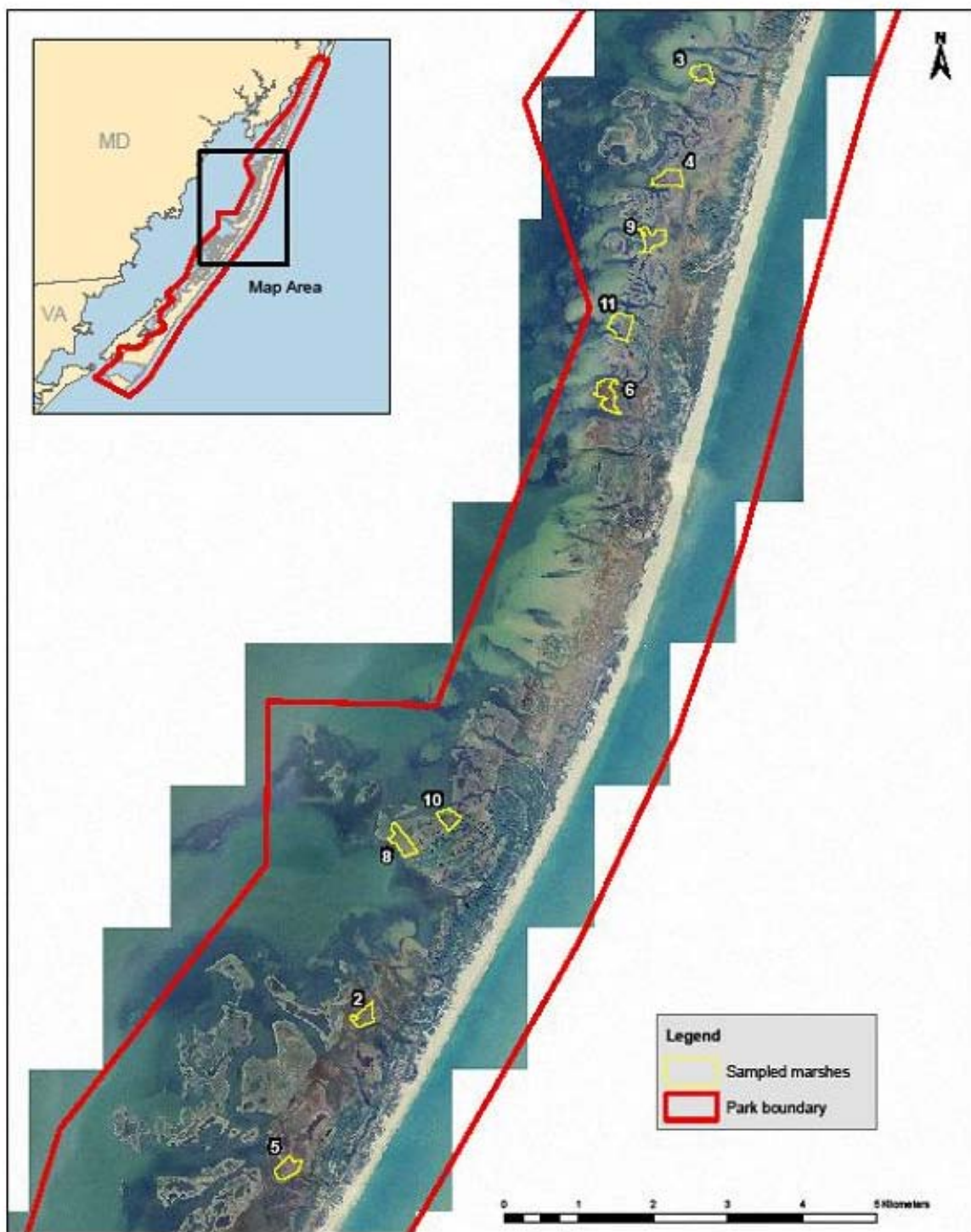


Figure 1. Permanent nekton and vegetation monitoring sites established by NCBN at Assateague Island National Seashore (ASIS) in 2008.

Table 1. Sampling dates and number of unique nekton sampling stations at each site at ASIS in 2012. Sampling stations are displayed by habitat type. ‘-’ indicates habitat not available. ‘*’ one or more stations could not be sampled due to insufficient water or inaccessibility. ‘+’ Nekton sampling at site 8 was not conducted during Event 1.

Site	Event	Dates	Habitat		Total
			Pool/Panne	Tidal Creek	
2	Early	6/14/2012	10	-	10
2	Late	8/6/2012	8	-	8
3	Early	6/22/2012	12	-	12
3	Late	7/30/2012	12	-	12
4	Early	6/11/2012	10	4	14
4	Late	8/1/2012	10	4	14
5	Early	6/13/2012	13	-	13
5	Late	8/8/2012	11	-	11
6	Early	6/12/2012	15	-	15
6	Late	7/31/2012	15	-	15
8	Late	8/2/2012	15	-	15
9	Early	6/15/2012	15	2	17
9	Late	8/7/2012	13	2	15
10	Early	6/21/2012	17	-	17
10	Late	8/9/2012	17	-	17
11	Early	6/18/2012	12	-	12
11	Late	8/3/2012	13	-	13

Vegetation Plot Selection and Data Collection

Vegetation sampling was conducted once at each of the nine marsh sites (Table 2). For each site, ten transects extending from bay to upland were systematically placed based on a single random start (James-Pirri et al. In Review). Plots were established by treating the total length of all ten transects as a single transect and randomly selecting points (*i.e.*, plots) along this total length. This combination of systematic transects and replicate plots is necessary to ensure interspersed of the plots throughout the marsh study area, thus providing a representative sample of all salt marsh communities (*e.g.*, low marsh, high marsh).

All vegetation species and non-vegetation cover types present in each plot were recorded (Table 3), and the estimated percent cover was determined using a modified Braun-Blanquet cover scale (0: 0%; 1: <1%; 2: 1-5%; 3: 6-25%; 4: 26-50%; 5: 51-75%; 6: 76-100%), (Kent and Coker 1992).

Table 2. Sampling dates and total number of vegetation plots sampled at nine marsh sites at ASIS in 2012.

Site	Dates	Total
2	7/20/2012	50
3	7/9/2012	50
4	7/11/2012	53
5	7/13/2012	50
6	7/10/2012	50
8	7/12/2012	49
9	7/17/2012	50
10	7/19/2012	49
11	7/18/2012	50

Table 3. Definition of standard cover type categories used in the Northeast Coastal and Barrier Network salt marsh vegetation monitoring protocol (James-Pirri et al. In Review).

Live vascular plants	Identified by species (herbaceous and shrubs).
Standing non-living vascular plants	Identified by species (e.g., <i>S. alterniflora</i> Not Living). This category only includes standing dead (attached) plants that are from a previous year's growth. There may be some dead leaves from this year's growth (e.g., the ends of leaves or leaves that are being replaced by new growth, etc.). In cases where dead leaves are from the current growing season, plant cover is recorded as live.
Macroalgae	Identified by species. This category generally includes the rockweeds (e.g., <i>Fucus</i> , <i>Ascophyllum</i>). Microalgae (e.g., diatom mats) and fine filamentous algae are not included in this category.
Bare ground	Includes mud, sand, microalgae cover, etc. These are areas that are not flooded with water and are devoid of standing live, standing dead, or macroalgae. There can be a thin film of surface water within the bare ground category.
Water	Permanent standing water is identified in plots that are partly within a creek, ditch, marsh pool, or flooded panne.
Wrack/litter	Wrack is material that has floated into the plot. This is generally dead (not attached) plant material, but could also be trash. Litter is dead plant material that is highly decomposed and is no longer attached.
Trash	Items such as logs, old piers, tires, etc.
Rock	Boulders or rocks can be found on the surface of northern New England marshes.

Data Summary

Nekton

Nekton species composition, average density, average length, and standard error were calculated using standard formulae. The same is true of the average values of the environmental variables (water temp, salinity, and depth) calculated for each habitat type during each sampling event. Details can be found in the Analysis and Reporting Standard Operating Procedure of James-Pirri et al. (2012).

Vegetation

Vegetation data were recorded using the modified Braun-Blanquet scale as described above (Kent and Coker 1992). For summary purposes, each Braun-Blanquet value was converted to the midpoint of the percent range it represented (Table 4) as described in Wikum and Shanholtzer (1978), and the average percent cover was calculated for each species and non-vegetation cover type using these mid-points.

Table 4. Modified Braun-Blanquet scale and corresponding midpoint values for determining percent cover of each vegetation species and non-vegetation cover type.

BB Value	Percent Cover	Midpoint
0	0%	0%
1	< 1%	0.50%
2	1 - 5%	3%
3	6 - 25%	15.50%
4	26 - 50%	38%
5	51 - 75%	63%
6	76 - 100%	88%

Wikum and Shanholtzer (1978) outline a method for calculating an importance value for each species. So as not to confuse this value with ecological importance, it is referred to here as a ‘relative prevalence’ value. Although Wikum and Shanholtzer (1978) present their ‘importance value’ as a sum of the percent frequency and percent cover values, here these values have been averaged so that relative prevalence is on a more readily interpretable percent scale. Relative percent prevalence for a species is the average of the relative percent cover and the relative percent frequency, where relative percent cover is the percentage of all plots that the species covers relative to all other species present, and relative percent frequency is the number of plots in which each species is present relative to all other species present. A detailed description of the analyses and formulae are presented in the salt marsh vegetation protocol (James-Pirri et al. In Review). Because the relative percent prevalence incorporates both percent frequency and percent cover, it provides information about how a species is distributed (*i.e.*, its ‘patchiness’) throughout the salt marsh and may differ substantially from the average percent cover for a given species.

Species were grouped by salinity tolerance (USDA 2013) to help characterize the vegetation community. Species listed by the United States Department of Agriculture (USDA), the state of Maryland or the commonwealth of Virginia as exotic, invasive, threatened, endangered, or rare, are noted in the vegetation table. Information about plants listed by each state is available online (USDA 2013). Additional information about species listed by the state of Maryland or the commonwealth of Virginia is also available online (Maryland Invasive Species Council 2010, Maryland Natural heritage Program 2010, VA DCR 2009, Townsend 2009). The locations of sample plots where listed species were observed are noted in Appendix A.

Results

Nekton

The average nekton density at ASIS is presented in Tables 5a and b. A total of eight nekton species were captured in 2012 (Table 6). Common mummichog (*F. heteroclitus*), sheepshead minnow (*C. variegatus*), and rainwater killifish (*L. parva*) accounted for approximately 97% of all nekton captured (Table 7). The average, maximum, and minimum lengths for each species observed in 2012 are presented in Tables 8a and b. Additional tables summarizing data by site are provided in the Appendices.

One invasive species, the European green crab (*Carcinus maenas*) was observed during the 2012 field season. One individual was found at Site 10 during the first sampling event. Information about the European green crab can be found on the USDA's National Invasive Species Information Center website (Invasivespeciesinfo.gov).

Table 5. (a) Average density and standard error [individuals per 1 m² ± SE (total count)] of nekton captured at ASIS in 2012. '*' Site 8 was not sampled during Event 1. Data were summarized for each sampling event and both events combined. (b) Number of unique nekton stations sampled at ASIS in 2012. '*' Site 8 was not sampled during Event 1.

(a)

Habitat	Average Density [individuals per 1 m ² ± SE (total count)]		
	Event 1	Event 2	Events 1 & 2
Pool/Panne	15.8 ± 2.3 (1664)	11.2 ± 1.8 (1272)	13.1 ± 1.6 (2936)
Tidal Creek	2.0 ± 1.0 (12)	19.7 ± 14.1 (118)	10.8 ± 6.9 (130)
All	15.2 ± 2.2 (1676)	11.6 ± 1.8 (1390)	13.0 ± 1.6 (3066)

(b)

Habitat	No. of Stations		
	Event 1	Event 2	Events 1 & 2
Pool/Panne	104	114	121
Tidal Creek	6	6	6
All	110	120	127

Table 6. Nekton species richness (No. of species observed) at ASIS in 2012. Data were summarized for each sampling event and both events combined. '*' Site 8 was not sampled during Event 1.

Event	No. of Stations	No. of Species Observed
1*	110	7
2	120	6
1* & 2	127	8

Table 7. Nekton species and community composition (%) at ASIS in 2012. Data were summarized for each sampling event and both events combined. n = total number of nekton captured during that event. ‘+’ indicates exotic / invasive species. ‘*’ Site 8 was not sampled during Event 1.

Life History Group/Species	Common Name	Group/Species Composition (%)		
		Event 1 (n = 1676)	Event 2 (n = 1390)	Events 1 & 2 (n = 3066)
Resident Crustacean		0.1	-	< 0.05
<i>Carcinus maenas</i> ⁺	green crab	0.1	-	< 0.05
Resident Fish		96.8	98.5	97.6
<i>Cyprinodon variegatus</i>	sheepshead minnow	54.9	44.0	49.9
<i>Fundulus heteroclitus</i>	mummichog	24.1	27.3	25.5
<i>Lucania parva</i>	rainwater killifish	17.8	27.2	22.1
<i>Fundulus majalis</i>	striped killifish	-	0.1	< 0.05
Transient Crustacean		2.6	0.4	1.6
<i>Callinectes sapidus</i>	blue crab	2.6	0.4	1.6
Transient Fish		0.5	1.2	0.8
<i>Menidia beryllina</i>	inland silverside	0.4	1.2	0.7
<i>Leiostomas xanthurus</i>	spot	0.1	-	0.1

Table 8. (a) Average length [mm $\pm$ SE (no. measured)] of nekton at ASIS in 2012. Length data for each species was summarized over all stations sampled during each event and both events combined. '*' Site 8 was not sampled during Event 1. '+' indicates exotic / invasive species. (b) Minimum and maximum length (mm) of each nekton species at ASIS in 2012. '*' Site 8 was not sampled during Event 1. '+' indicates exotic / invasive species.

(a)

Life History Group/Species	Common Name	Average Length [mm ± SE (no. measured)]		
		Event 1	Event 2	Events 1 & 2
Resident Crustacean				
<i>Carcinus maenas</i> +	green crab	30.0 (1)	--	30.0 (1)
Resident Fish				
<i>Cyprinodon variegatus</i>	sheepshead minnow	15.8 ± 0.3 (574)	22.4 ± 0.5 (428)	18.6 ± 0.3 (1002)
<i>Fundulus heteroclitus</i>	mummichog	18.7 ± 0.7 (286)	34.2 ± 1.0 (269)	26.2 ± 0.7 (555)
<i>Fundulus majalis</i>	striped killifish	--	105.0 (1)	105.0 (1)
<i>Lucania parva</i>	rainwater killifish	18.1 ± 0.4 (155)	22.1 ± 0.3 (224)	20.4 ± 0.3 (379)
Transient Crustacean				
<i>Callinectes sapidus</i>	blue crab	45.5 ± 3.9 (44)	69.4 ± 7.3 (5)	47.9 ± 3.7 (49)
Transient Fish				
<i>Leiostomas xanthurus</i>	spot	61.5 ± 1.5 (2)	--	61.5 ± 1.5 (2)
<i>Menidia beryllina</i>	inland silverside	37.2 ± 9.3 (6)	28.8 ± 2.3 (16)	31.0 ± 3.0 (22)

(b)

Life History Group/Species	Common Name	Event 1		Event 2		Events 1 & 2	
		Min.	Max.	Min.	Max.	Min.	Max.
Resident Crustacean							
<i>Carcinus maenas</i> ⁺	green crab	30	30	--	--	30	30
Resident Fish							
<i>Cyprinodon variegatus</i>	sheepshead minnow	3	56	5	59	3	59
<i>Fundulus heteroclitus</i>	mummichog	3	72	6	97	3	97
<i>Fundulus majalis</i>	striped killifish	--	--	105	105	105	105
<i>Lucania parva</i>	rainwater killifish	9	42	8	36	8	42
Transient Crustacean							
<i>Callinectes sapidus</i>	blue crab	8	124	51	90	8	124
Transient Fish							
<i>Leiostomas xanthurus</i>	spot	60	63	--	--	60	63
<i>Menidia beryllina</i>	inland silverside	12	61	10	54	10	61

Water temperature, depth, and salinity at each nekton sampling station were measured during each sampling event (Table 9). Currently, these data are collected in a manner that may help to explain anomalies in nekton observed at a particular location during a specific sampling event. These parameters would need to be measured continuously over the course of the field season in order to lend any real insight into observed changes in the nekton community.

Table 9. Average water temperature, depth, and salinity [Average $\pm$ SE (no. of stations)] at nekton sampling stations at ASIS in 2012. Data were summarized over all stations for each sampling event. ‘*’ Site 8 was not sampled during Event 1.

Habitat	Average $\pm$ SE (no. of stations)			
	Event 1*		Event 2	
	Pool/Panne	Tidal Creek	Pool/Panne	Tidal Creek
Temperature ($^{\circ}$ C)	25.0 $\pm$ 0.5 (105)	25.2 $\pm$ 1.4 (6)	28.0 $\pm$ 0.3 (113)	24.8 $\pm$ 0.4 (5)
Depth (cm)	16.8 $\pm$ 1 (104)	35.1 $\pm$ 2.5 (6)	17.2 $\pm$ 1.1 (114)	35.9 $\pm$ 3.6 (6)
Salinity (ppt)	35.2 $\pm$ 0.5 (98)	30.5 $\pm$ 0.6 (6)	37.6 $\pm$ 0.6 (113)	33.4 $\pm$ 1.6 (5)

Vegetation

Fourteen vegetation species and four non-vegetation cover types (bare ground, water, wrack & litter, and trash) were recorded at ASIS in 2012 (Table 10). As explained in the Data Summary section, the relative percent prevalence combines information about how much of each site each species ‘covers’ relative to all other species present and how frequently it appears throughout the site relative to all other species present. Tables summarizing vegetation data by site are provided in the Appendices.

Table 10. Average percent cover (Average % Cover $\pm$ SE), frequency, and relative percent prevalence of each plant species and non-vegetation cover type observed at ASIS in 2012. Data were summarized over all 451 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). (NL) indicates standing non-living vegetation.

Cover Type		Avg. % Cover $\pm$ SE	Frequency	Rel. % Cover	Rel. % Freq.	Rel. % Prevalence
Salinity Tolerance						
Species	Common Name					
Vegetation		49.5 $\pm$ 2.1	358	45.9	65.9	55.9
High Salinity Tolerance		49.5 $\pm$ 2.1	358	45.9	65.7	55.8
<i>Spartina alterniflora</i>	saltmarsh cordgrass	20.8 $\pm$ 1.3	264	19.3	15.5	17.4
<i>Spartina alterniflora</i> (NL)	saltmarsh cordgrass (NL)	5.7 $\pm$ 0.4	236	5.3	13.8	9.6
<i>Salicornia maritima</i>	glasswort	4.9 $\pm$ 0.4	208	4.5	12.2	8.3
<i>Salicornia maritima</i> (NL)	glasswort (NL)	0.1 $\pm$ 0	15	0.1	0.9	0.5
<i>Distichlis spicata</i>	spikegrass	4.8 $\pm$ 0.7	128	4.5	7.5	6.0
<i>Distichlis spicata</i> (NL)	spikegrass (NL)	3.0 $\pm$ 0.5	92	2.8	5.4	4.1
<i>Spartina patens</i>	salt meadow cordgrass	5.2 $\pm$ 0.8	66	4.8	3.9	4.3
<i>Spartina patens</i> (NL)	salt meadow cordgrass (NL)	2.3 $\pm$ 0.5	30	2.1	1.8	2.0
<i>Iva frutescens</i>	marsh elder	1.3 $\pm$ 0.3	27	1.2	1.6	1.4
<i>Iva frutescens</i> (NL)	marsh elder (NL)	0.7 $\pm$ 0.2	22	0.6	1.3	1.0
<i>Limonium carolinianum</i>	sea lavender	0.2 $\pm$ 0.1	12	0.2	0.7	0.4
<i>Atriplex patula</i>	spear saltbush	< 0.05	5	< 0.05	0.3	0.2
<i>Juncus roemerianus</i>	black needle rush	0.2 $\pm$ 0.1	2	0.2	0.1	0.2
<i>Juncus roemerianus</i> (NL)	black needle rush (NL)	0.1 $\pm$ 0.1	2	0.1	0.1	0.1
<i>Salicornia depressa</i>	Virginia glasswort	0.1 $\pm$ 0	4	0.1	0.2	0.2
<i>Juncus gerardii</i>	black grass	< 0.05	1	< 0.05	0.1	< 0.05
<i>Juncus gerardii</i> (NL)	black grass (NL)	0.1 $\pm$ 0.1	1	0.1	0.1	0.1
<i>Ruppia maritima</i>	widgeon grass	< 0.05	2	< 0.05	0.1	< 0.05
<i>Suaeda maritima</i>	herbaceous seepweed	< 0.05	1	< 0.05	0.1	< 0.05
Medium Salinity Tolerance		< 0.05	2	< 0.05	0.2	0.1
<i>Morella cerifera</i> (NL)	Southern bayberry (NL)	< 0.05	1	< 0.05	0.1	< 0.05
<i>Toxicodendron radicans</i>	poison ivy	< 0.05	1	< 0.05	0.1	< 0.05

Table10. Average percent cover (Average % Cover $\pm$ SE), frequency, and relative percent prevalence of each plant species and non-vegetation cover type observed at ASIS in 2012. Data were summarized over all 451 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). (NL) indicates standing non-living vegetation (continued).

Cover Type		Avg. % Cover $\pm$ SE	Frequency	Rel. % Cover	Rel. % Freq.	Rel. % Prevalence
Salinity Tolerance	Common Name					
Species						
Non-Vegetation		49.3 $\pm$ 1.8	369	45.8	23.9	34.8
<i>water</i>	water	38.1 $\pm$ 1.9	247	35.3	14.5	24.9
<i>bare ground</i>	bare ground	11.3 $\pm$ 1.1	160	10.4	9.4	9.9
Incidental Cover		9.0 $\pm$ 0.8	176	8.4	10.5	9.4
<i>Wrack & litter</i>	wrack & litter	8.9 $\pm$ 0.8	173	8.3	10.1	9.2
<i>trash</i>	garbage / trash	0.1 $\pm$ 0	6	0.1	0.4	0.2

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Appendix A.Coordinates for nekton stations sampled at ASIS in 2012

Table A-1. Coordinates for nekton stations sampled at ASIS site 2 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A2P1_41_2012	480258	4213462
A2P10_29_2012	480150	4213371
A2P2_273_2012	480162	4213426
A2P3_229_2012	480126	4213324
A2P4_201_2012	480179	4213382
A2P5_188_2012	480149	4213350
A2P6_282_2012	480048	4213274
A2P7_110_2012	480226	4213436
A2P8_91_2012	480235	4213415
A2P9_58_2012	480085	4213275

Table A-2. Coordinates for nekton stations sampled at ASIS site 3 in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A3P1_184_2012	484526	4225915
A3P10_196_2012	484741	4225836
A3P11_148_2012	484685	4225866
A3P12_241_2012	484681	4225885
A3P13_220_2012	484617	4225895
A3P2_27_2012	484699	4225853
A3P3_54_2012	484760	4225873
A3P4_216_2012	484695	4225870
A3P5_342_2012	484581	4225915
A3P6_2_2012	484628	4225927
A3P7_331_2012	484747	4225863
A3P8_224_2012	484543	4225944
A3P9_282_2012	484714	4225872

Table A-3. Coordinates for nekton stations sampled at ASIS site 4 in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A4C_15_2012	484398	4224463
A4C_37_2012	484384	4224467
A4C_46_2012	484374	4224469
A4C_6_2012	483979	4224495
A4P1_336_2012	484263	4224516
A4P10_76_2012	484356	4224449
A4P2_336_2012	484331	4224456
A4P3_131_2012	484333	4224524
A4P4_44_2012	484161	4224494
A4P5_209_2012	484354	4224410
A4P6_78_2012	484014	4224478
A4P7_41_2012	484325	4224454
A4P8_357_2012	484131	4224495
A4P9_143_2012	484374	4224406

Table A-4. Coordinates for nekton stations sampled at ASIS site 5 in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A5P1_110_2012	479093	4211259
A5P10_320_2012	479101	4211232
A5P11_68_2012	479084	4211336
A5P12_X_2012	479028	4211172
A5P13_149_2012	479059	4211187
A5P2_149_2012	479123	4211172
A5P3_297_2012	479042	4211170
A5P4_311_2012	479036	4211285
A5P5_203_2012	479075	4211266
A5P6_293_2012	479092	4211185
A5P7_205_2012	479094	4211368
A5P8_27_2012	479095	4211389
A5P9_328_2012	479036	4211200

Table A-5. Coordinates for nekton stations sampled at ASIS site 6 in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A6P1_183_2012	483485	4221600
A6P10_243_2012	483345	4221600
A6P11_22_2012	483475	4221633
A6P12_344_2012	483471	4221431
A6P13_12_2012	483405	4221461
A6P14_270_2012	483416	4221746
A6P15_183_2012	483477	4221414
A6P16_266_2012	483442	4221602
A6P2_261_2012	483436	4221538
A6P3_161_2012	483480	4221535
A6P4_147_2012	483448	4221486
A6P5_56_2012	483485	4221562
A6P6_106_2012	483399	4221676
A6P8_145_2012	483418	4221576
A6P9_184_2012	483427	4221752

Table A-6. Coordinates for nekton stations sampled at ASIS site 8 in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A8P1_126_2012	480720	4215592
A8P10_68_2012	480746	4215607
A8P11_223_2012	480508	4215639
A8P12_278_2012	480722	4215514
A8P13_135_2012	480614	4215555
A8P14_20_2012	480644	4215726
A8P15_27_2012	480619	4215667
A8P2_175_2012	480674	4215687
A8P3_126_2012	480562	4215674
A8P4_250_2012	480650	4215640
A8P5_129_2012	480512	4215654
A8P6_160_2012	480641	4215714
A8P7_88_2012	480588	4215675
A8P8_43_2012	480606	4215658
A8P9_305_2012	480694	4215630

Table A-7. Coordinates for nekton stations sampled at ASIS site 9 in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A9C_80_2012	484002	4223742
A9C_99_2012	484002	4223733
A9P10_44_2012	483974	4223652
A9P11_72_2012	483971	4223730
A9P12_161_2012	484071	4223605
A9P13_328_2012	483906	4223733
A9P15_135_2012	483981	4223672
A9P16_139_2012	483926	4223698
A9P17_12_2012	484054	4223730
A9P18_196_2012	484086	4223754
A9P19_323_2012	484052	4223837
A9P2_77_2012	484086	4223659
A9P20_225_2012	484021	4223756
A9P3_40_2012	484119	4223717
A9P4_315_2012	483932	4223723
A9P6_243_2012	484025	4223725
A9P7_210_2012	483963	4223679
A9P8_215_2012	483966	4223716

Table A-8. Coordinates for nekton stations sampled at ASIS site 10 in 2012, UTM, Zone 18, NAD 83, meters. ** *Carcinus maenas*, an invasive /exotic species was present.

Station ID	UTMX (east)	UTMY (north)
A10C_32_2012	481181	4216009
A10C_48_2012*	481144	4216016
A10C_60_2012	481148	4216010
A10P1_270_2012	481205	4215983
A10P10_179_2012	481208	4215858
A10P11_243_2012	481207	4215985
A10P12_74_2012	481197	4215900
A10P13_221_2012	481269	4216009
A10P14_104_2012	481278	4215849
A10P15_211_2012	481288	4215809
A10P2_253_2012	481188	4215855
A10P3_197_2012	481218	4215932
A10P4_39_2012	481206	4215994
A10P5_135_2012	481301	4215827
A10P6_67_2012	481220	4215963
A10P7_16_2012	481312	4215958
A10P8_211_2012	481265	4215819
A10P9_170_2012	481220	4215980

Table A-9. Coordinates for nekton stations sampled at ASIS site 11 in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A11P1_129_2012	483691	4222555
A11P10_359_2012	483681	4222651
A11P11_305_2012	483575	4222630
A11P13_212_2012	483677	4222516
A11P14_155_2012	483617	4222662
A11P15_153_2012	483655	4222480
A11P16_206_2012	483677	4222505
A11P2_202_2012	483678	4222572
A11P4_108_2012	483695	4222618
A11P5_331_2012	483600	4222474
A11P6_144_2012	483517	4222661
A11P7_223_2012	483470	4222632
A11P8_153_2012	483628	4222377
A11P9_327_2012	483577	4222395

Appendix B: Coordinates for vegetation plot locations at ASIS in 2012

Table B-1. Coordinates for vegetation plots sampled ASIS site 2 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A2V1012_2012	480075	4213313	A2V3612_2012	480152	4213255
A2V1112_2012	479958	4213292	A2V3712_2012	480086	4213222
A2V112_2012	480240	4213470	A2V3812_2012	480130	4213364
A2V1212_2012	479996	4213225	A2V3912_2012	479997	4213224
A2V1312_2012	480174	4213291	A2V4112_2012	480038	4213230
A2V1412_2012	480201	4213319	A2V4212_2012	480153	4213329
A2V1512_2012	480068	4213175	A2V4312_2012	480069	4213322
A2V1612_2012	480007	4213210	A2V4412_2012	480083	4213297
A2V1712_2012	480049	4213281	A2V4512_2012	480101	4213198
A2V1812_2012	480070	4213321	A2V4612_2012	480081	4213229
A2V1912_2012	479969	4213273	A2V4712_2012	480217	4213364
A2V2012_2012	480107	4213328	A2V4812_2012	480072	4213241
A2V2112_2012	480086	4213292	A2V5012_2012	480229	4213419
A2V2212_2012	480046	4213286	A2V512_2012	479999	4213222
A2V2312_2012	480122	4213232	A2V5312_2012	480122	4213388
A2V2412_2012	480114	4213246	A2V5412_2012	480153	4213397
A2V2612_2012	480015	4213195	A2V5512_2012	480133	4213358
A2V2712_2012	480138	4213208	A2V5612_2012	480107	4213258
A2V2812_2012	480134	4213289	A2V5812_2012	480171	4213295
A2V2912_2012	480043	4213296	A2V5912_2012	480170	4213371
A2V3012_2012	480086	4213223	A2V6012_2012	480236	4213474
A2V3112_2012	480143	4213344	A2V612_2012	480038	4213299
A2V3212_2012	480056	4213270	A2V712_2012	480090	4213362
A2V3412_2012	480103	4213266	A2V812_2012	480207	4213453
A2V3512_2012	480121	4213239	A2V912_2012	480175	4213436

Table B-2. Coordinates for vegetation plots sampled ASIS site 3 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A3V1012_2012	484751	4225847	A3V3212_2012	484722	4225866
A3V1112_2012	484647	4225955	A3V3312_2012	484665	4225902
A3V112_2012	484607	4225949	A3V3412_2012	484754	4225851
A3V1212_2012	484586	4225874	A3V3512_2012	484710	4225939
A3V1312_2012	484607	4225835	A3V3612_2012	484778	4225804
A3V1412_2012	484772	4225791	A3V3712_2012	484728	4225993
A3V1512_2012	484725	4225987	A3V3812_2012	484730	4225884
A3V1612_2012	484656	4225994	A3V3912_2012	484793	4225855
A3V1712_2012	484716	4225843	A3V4012_2012	484767	4225776
A3V1812_2012	484526	4225913	A3V4112_2012	484563	4225923
A3V1912_2012	484767	4225904	A3V412_2012	484608	4225841
A3V2012_2012	484734	4225896	A3V4212_2012	484566	4225935
A3V2112_2012	484708	4225937	A3V4312_2012	484566	4225930
A3V212_2012	484649	4225968	A3V4412_2012	484691	4225887
A3V2212_2012	484543	4225972	A3V4512_2012	484629	4225905
A3V2312_2012	484633	4225915	A3V4612_2012	484546	4225983
A3V2412_2012	484768	4225781	A3V4712_2012	484627	4225901
A3V2512_2012	484705	4225914	A3V4812_2012	484737	4225907
A3V2612_2012	484652	4225979	A3V4912_2012	484722	4225971
A3V2712_2012	484619	4225993	A3V5012_2012	484583	4225988
A3V2812_2012	484661	4225884	A3V512_2012	484588	4225892
A3V2912_2012	484724	4225982	A3V612_2012	484692	4225877
A3V3012_2012	484581	4225980	A3V712_2012	484568	4225816
A3V3112_2012	484750	4225841	A3V812_2012	484782	4225819
A3V312_2012	484692	4225980	A3V912_2012	484716	4225957

Table B-3. Coordinates for vegetation plots sampled ASIS site 4 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A4V1012_2012	484197	4224554	A4V3412_2012	484179	4224536
A4V1112_2012	484322	4224460	A4V3512_2012	484098	4224431
A4V112_2012	484334	4224551	A4V3612_2012	484087	4224472
A4V1212_2012	484300	4224530	A4V3712_2012	484337	4224572
A4V1312_2012	484113	4224451	A4V3812_2012	484111	4224517
A4V1412_2012	484006	4224454	A4V3912_2012	484387	4224417
A4V1512_2012	484333	4224462	A4V4012_2012	484228	4224444
A4V1612_2012	484297	4224596	A4V4112_2012	484327	4224593
A4V1712_2012	484358	4224420	A4V412_2012	484108	4224495
A4V1812_2012	484208	4224424	A4V4212_2012	484372	4224484
A4V1912_2012	484159	4224470	A4V4312_2012	484324	4224420
A4V2012_2012	484399	4224482	A4V4412_2012	484347	4224461
A4V2112_2012	484131	4224536	A4V4512_2012	484223	4224464
A4V212_2012	484299	4224551	A4V4612_2012	484373	4224526
A4V2212_2012	484170	4224424	A4V4712_2012	484120	4224579
A4V2312_2012	484298	4224487	A4V4912_2012	484071	4224428
A4V2412_2012	484355	4224549	A4V5012_2012	484249	4224488
A4V2512_2012	484172	4224424	A4V512_2012	484295	4224465
A4V2612_2012	484162	4224599	A4V5212_2012	484219	4224513
A4V2712_2012	484402	4224437	A4V5412_2012	484306	4224573
A4V2812_2012	484282	4224461	A4V5512_2012	484260	4224488
A4V2912_2012	484241	4224445	A4V5612_2012	484278	4224423
A4V3012_2012	484240	4224446	A4V612_2012	484187	4224629
A4V3112_2012	484006	4224453	A4V712_2012	484312	4224597
A4V312_2012	484268	4224487	A4V812_2012	484318	4224488
A4V3212_2012	484315	4224530	A4V912_2012	484106	4224473
A4V3312_2012	484290	4224551			

Table B-4. Coordinates for vegetation plots sampled ASIS site 5 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A5V1012_2012	479218	4211244	A5V3412_2012	479100	4211404
A5V112_2012	478965	4211094	A5V3512_2012	478958	4211257
A5V1212_2012	479188	4211253	A5V3612_2012	479062	4211138
A5V1312_2012	479020	4211314	A5V3712_2012	478979	4211085
A5V1412_2012	479195	4211249	A5V3812_2012	478996	4211282
A5V1512_2012	479126	4211316	A5V3912_2012	479233	4211360
A5V1612_2012	479208	4211205	A5V4012_2012	478953	4211217
A5V1712_2012	479062	4211098	A5V4112_2012	479065	4211299
A5V1812_2012	479092	4211207	A5V412_2012	479172	4211217
A5V1912_2012	479174	4211259	A5V4212_2012	479026	4211271
A5V2112_2012	479053	4211102	A5V4312_2012	479188	4211254
A5V212_2012	479120	4211157	A5V4412_2012	478968	4211090
A5V2212_2012	479063	4211259	A5V4512_2012	478991	4211084
A5V2312_2012	479034	4211148	A5V4612_2012	479067	4211178
A5V2412_2012	479055	4211221	A5V4712_2012	479226	4211240
A5V2512_2012	479131	4211395	A5V4812_2012	479049	4211346
A5V2612_2012	478996	4211122	A5V4912_2012	479055	4211142
A5V2712_2012	479100	4211124	A5V5012_2012	479011	4211117
A5V2812_2012	478989	4211246	A5V5112_2012	479263	4211346
A5V2912_2012	479104	4211203	A5V512_2012	479131	4211314
A5V3012_2012	479194	4211291	A5V5212_2012	479226	4211279
A5V3112_2012	479104	4211283	A5V612_2012	478982	4211168
A5V312_2012	479143	4211392	A5V712_2012	479066	4211178
A5V3212_2012	479111	4211325	A5V812_2012	479137	4211353
A5V3312_2012	479114	4211401	A5V912_2012	479145	4211228

Table B-5. Coordinates for vegetation plots sampled ASIS site 6 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A6V1012_2012	483392	4221465	A6V3212_2012	483394	4221780
A6V1112_2012	483346	4221648	A6V3312_2012	483373	4221781
A6V112_2012	483516	4221377	A6V3412_2012	483442	4221736
A6V1212_2012	483513	4221425	A6V3512_2012	483350	4221779
A6V1312_2012	483245	4221599	A6V3612_2012	483392	4221645
A6V1412_2012	483373	4221604	A6V3712_2012	483428	4221556
A6V1512_2012	483378	4221691	A6V3912_2012	483497	4221421
A6V1612_2012	483374	4221646	A6V4012_2012	483508	4221420
A6V1712_2012	483422	4221692	A6V4112_2012	483518	4221377
A6V1812_2012	483442	4221556	A6V412_2012	483343	4221734
A6V1912_2012	483331	4221736	A6V4212_2012	483398	4221734
A6V2012_2012	483314	4221738	A6V4312_2012	483470	4221644
A6V2112_2012	483351	4221645	A6V4412_2012	483325	4221779
A6V212_2012	483302	4221781	A6V4512_2012	483411	4221601
A6V2212_2012	483384	4221778	A6V4612_2012	483423	4221780
A6V2312_2012	483300	4221693	A6V4712_2012	483277	4221600
A6V2412_2012	483509	4221421	A6V4812_2012	483325	4221780
A6V2512_2012	483422	4221467	A6V4912_2012	483297	4221601
A6V2612_2012	483387	4221644	A6V5012_2012	483414	4221691
A6V2712_2012	483379	4221422	A6V512_2012	483385	4221421
A6V2812_2012	483412	4221647	A6V5212_2012	483279	4221736
A6V2912_2012	483384	4221737	A6V612_2012	483393	4221465
A6V3012_2012	483361	4221599	A6V712_2012	483514	4221374
A6V3112_2012	483396	4221735	A6V812_2012	483370	4221468
A6V312_2012	483532	4221376	A6V912_2012	483313	4221782

Table B-6. Coordinates for vegetation plots sampled ASIS site 8 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A8V1012_2012	480581	4215683	A8V3212_2012	480568	4215775
A8V1112_2012	480568	4215659	A8V3312_2012	480554	4215638
A8V112_2012	480504	4215706	A8V3412_2012	480510	4215810
A8V1212_2012	480577	4215801	A8V3512_2012	480670	4215489
A8V1312_2012	480691	4215464	A8V3612_2012	480742	4215471
A8V1412_2012	480585	4215565	A8V3712_2012	480542	4215770
A8V1512_2012	480653	4215476	A8V3812_2012	480620	4215708
A8V1612_2012	480616	4215717	A8V3912_2012	480782	4215458
A8V1712_2012	480605	4215769	A8V4112_2012	480550	4215836
A8V1812_2012	480511	4215808	A8V412_2012	480546	4215689
A8V1912_2012	480667	4215680	A8V4212_2012	480665	4215609
A8V2012_2012	480725	4215594	A8V4312_2012	coordinates not recorded	
A8V2112_2012	480656	4215547	A8V4412_2012	480584	4215752
A8V212_2012	480830	4215511	A8V4512_2012	480546	4215654
A8V2212_2012	480486	4215697	A8V4612_2012	480552	4215793
A8V2312_2012	coordinates not recorded		A8V4712_2012	480570	4215585
A8V2412_2012	480732	4215485	A8V4812_2012	480592	4215593
A8V2512_2012	480649	4215634	A8V4912_2012	480693	4215501
A8V2612_2012	480769	4215590	A8V5012_2012	480711	4215438
A8V2712_2012	480588	4215517	A8V512_2012	480531	4215746
A8V2812_2012	480513	4215660	A8V612_2012	480725	4215605
A8V2912_2012	480713	4215626	A8V712_2012	480735	4215519
A8V3012_2012	480668	4215494	A8V812_2012	480630	4215617
A8V3112_2012	480532	4215636	A8V912_2012	480704	4215633
A8V312_2012	480785	4215493	A8V3212_2012	480568	4215775
A8V1012_2012	480581	4215683	A8V3312_2012	480554	4215638
A8V1112_2012	480568	4215659	A8V3412_2012	480510	4215810

Table B-7. Coordinates for vegetation plots sampled ASIS site 9 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A9V1012_2012	484079	4223695	A9V3212_2012	484149	4223800
A9V1112_2012	484042	4223692	A9V3312_2012	484001	4223731
A9V112_2012	483893	4223549	A9V3412_2012	484125	4223730
A9V1212_2012	484041	4223765	A9V3512_2012	484061	4223693
A9V1312_2012	483907	4223729	A9V3612_2012	483911	4223514
A9V1412_2012	483909	4223587	A9V3712_2012	483915	4223767
A9V1512_2012	483901	4223803	A9V3812_2012	484009	4223657
A9V1612_2012	484036	4223692	A9V3912_2012	483887	4223839
A9V1712_2012	483957	4223731	A9V4012_2012	484181	4223766
A9V1812_2012	483862	4223698	A9V4112_2012	484025	4223624
A9V1912_2012	483912	4223623	A9V412_2012	483914	4223698
A9V2012_2012	483833	4223805	A9V4212_2012	483894	4223585
A9V2112_2012	484000	4223622	A9V4312_2012	483987	4223585
A9V212_2012	483929	4223730	A9V4412_2012	484058	4223765
A9V2212_2012	483945	4223622	A9V4512_2012	484093	4223767
A9V2312_2012	484102	4223799	A9V4612_2012	483899	4223514
A9V2412_2012	484165	4223803	A9V4712_2012	483831	4223519
A9V2512_2012	484110	4223730	A9V4812_2012	483928	4223839
A9V2612_2012	483854	4223517	A9V4912_2012	483945	4223622
A9V2712_2012	484083	4223766	A9V5012_2012	483898	4223698
A9V2812_2012	483937	4223551	A9V512_2012	483993	4223695
A9V2912_2012	483940	4223516	A9V612_2012	483895	4223625
A9V3012_2012	484005	4223729	A9V712_2012	483868	4223733
A9V3112_2012	484100	4223696	A9V812_2012	483947	4223767
A9V312_2012	483914	4223698	A9V912_2012	484111	4223656

Table B-8. Coordinates for vegetation plots sampled ASIS site 10 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A10V1012_2012	481295	4216021	A10V3712_2012	481300	4215909
A10V1112_2012	481316	4215881	A10V3912_2012	481230	4215884
A10V112_2012	481231	4215979	A10V4012_2012	481207	4215968
A10V1212_2012	481393	4215957	A10V4112_2012	481275	4216006
A10V1312_2012	481309	4215946	A10V4212_2012	481294	4216015
A10V1412_2012	481224	4215894	A10V4312_2012	481171	4215887
A10V1812_2012	481167	4215939	A10V4412_2012	481102	4216003
A10V1912_2012	481154	4215964	A10V4512_2012	481271	4215959
A10V2012_2012	481382	4215971	A10V4612_2012	481108	4215995
A10V2112_2012	481286	4215933	A10V4712_2012	481206	4215878
A10V212_2012	481170	4215934	A10V4812_2012	481206	4216023
A10V2212_2012	481237	4215824	A10V4912_2012	481316	4215886
A10V2412_2012	481328	4215867	A10V5012_2012	481329	4215963
A10V2512_2012	481239	4215966	A10V5112_2012	481127	4216007
A10V2612_2012	481130	4215953	A10V512_2012	481207	4216020
A10V2712_2012	481381	4215914	A10V5212_2012	481328	4215863
A10V2812_2012	481248	4215995	A10V5312_2012	481177	4215876
A10V2912_2012	481297	4215868	A10V5612_2012	481324	4216016
A10V3012_2012	481145	4215977	A10V5712_2012	481333	4216006
A10V3112_2012	481213	4215911	A10V5812_2012	481304	4215863
A10V312_2012	481201	4215981	A10V612_2012	481276	4216001
A10V3212_2012	481185	4216011	A10V712_2012	481188	4216010
A10V3312_2012	481345	4215936	A10V812_2012	481294	4215826
A10V3412_2012	481291	4215828	A10V912_2012	481283	4215892
A10V3612_2012	481183	4215919			

Table B-9. Coordinates for vegetation plots sampled ASIS site 11 in 2012, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A11V1012_2012	483648	4222392	A11V3212_2012	483557	4222558
A11V1112_2012	483544	4222389	A11V3312_2012	483538	4222601
A11V112_2012	483698	4222518	A11V3412_2012	483573	4222414
A11V1212_2012	483589	4222376	A11V3512_2012	483679	4222490
A11V1312_2012	483658	4222531	A11V3612_2012	483514	4222501
A11V1412_2012	483618	4222541	A11V3712_2012	483488	4222584
A11V1512_2012	483656	4222425	A11V3812_2012	483531	4222391
A11V1612_2012	483518	4222498	A11V3912_2012	483627	4222361
A11V1712_2012	483550	4222667	A11V4012_2012	483560	4222488
A11V1812_2012	483575	4222591	A11V4112_2012	483634	4222397
A11V1912_2012	483560	4222557	A11V412_2012	483634	4222574
A11V2012_2012	483607	4222441	A11V4212_2012	483601	4222548
A11V2112_2012	483611	4222615	A11V4312_2012	483552	4222631
A11V212_2012	483469	4222588	A11V4412_2012	483556	4222667
A11V2212_2012	483579	4222376	A11V4512_2012	483622	4222437
A11V2312_2012	483676	4222527	A11V4612_2012	483638	4222392
A11V2412_2012	483599	4222478	A11V4712_2012	483701	4222661
A11V2512_2012	483457	4222516	A11V4812_2012	483524	4222568
A11V2612_2012	483538	4222386	A11V4912_2012	483527	4222567
A11V2712_2012	483661	4222530	A11V5012_2012	483642	4222570
A11V2812_2012	483566	4222592	A11V512_2012	483512	4222502
A11V2912_2012	483654	4222672	A11V612_2012	483637	4222465
A11V3012_2012	483628	4222434	A11V712_2012	483640	4222677
A11V3112_2012	483585	4222373	A11V812_2012	483638	4222539
A11V312_2012	483459	4222625	A11V912_2012	483641	4222464

Appendix C: Nekton species and community density at ASIS in 2012 summarized by site and sampling event

Table C-1. (a) Average density and standard error [individuals per 1 m² ± SE (total count)] of nekton captured at ASIS in 2012. Data were summarized for each site and sampling event as well as both events combined. '*' Site 8 was not sampled during Event 1. (b) Number of unique stations sampled at each site during each sampling event. '*' Site 8 was not sampled during Event 1.

(a)

Site	Average Density		
	[individuals per 1 m ² ± SE (total count)]		
	Event 1	Event 2	Events 1 & 2
2	11.4 ± 4.1 (114)	19.6 ± 10.4 (157)	15.1 ± 5.1 (271)
3	5.7 ± 1.7 (68)	7.7 ± 3.6 (92)	6.7 ± 2.0 (160)
4	18.4 ± 6.3 (258)	4.9 ± 1.8 (68)	11.6 ± 3.5 (326)
5	8.8 ± 3.4 (115)	22.9 ± 10.1 (252)	15.3 ± 5.1 (367)
6	35.0 ± 10.3 (525)	9.9 ± 2.5 (149)	22.5 ± 5.7 (674)
8	not sampled	4.5 ± 2.4 (67)	4.5 ± 2.4 (67)
9	19.9 ± 7.0 (339)	19.1 ± 7.1 (286)	19.5 ± 4.9 (625)
10	5.7 ± 1.7 (97)	9.1 ± 3.6 (155)	7.4 ± 2.0 (252)
11	13.3 ± 3.7 (160)	12.6 ± 5.9 (164)	13.0 ± 3.5 (324)

(b)

Site	Event	No. of Stations	Observed No. of Species
2	1	10	3
2	2	8	3
3	1	12	5
3	2	12	3
4	1	14	5
4	2	14	4
5	1	13	5
5	2	11	5
6	1	15	4
6	2	15	3
8	1	not sampled	0
8	2	15	3
9	1	17	5
9	2	15	5
10	1	17	4
10	2	17	4
11	1	12	4
11	2	13	5

Appendix D: Nekton species richness at ASIS in 2012

Table D-1. Species richness (No. of species observed) at ASIS in 2012. Data were summarized by site.

Site	No. of Stations	Observed No. of Species
2	10	3
3	13	5
4	14	6
5	13	5
6	15	4
8	15	3
9	17	5
10	17	6
11	13	5

Appendix E: Nekton species and community composition summarized by site and sampling event

Table E-1. Nekton species and community composition (%) at ASIS in 2012. (a) Data were summarized by site. n = total number of nekton captured at that site. '+' indicates invasive / exotic species was present (Invasivespeciesinfo.gov). '-' Species or community was not present. '*' Site 8 was not sampled during Event 1. (b) Data are summarized by site and sampling event. n = Total number of nekton captured for that site and event. '-' species or community was not present. '*' Site 8 was not sampled during Event 1. '+' indicates invasive / exotic species was present (Invasivespeciesinfo.gov).

(a)

Life History Group/Species	Common Name	Group/Species Composition (%)								
		Site 2 (n=271)	Site 3 (n=160)	Site 4 (n=326)	Site 5 (n=367)	Site 6 (n=674)	Site 8 (n=67)	Site 9 (n=625)	Site 10 (n=252)	Site 11 (n=324)
Resident Crustacean		--	--	--	--	--	--	--	0.4	--
<i>Carcinus maenas</i> ⁺	green crab	--	--	--	--	--	--	--	0.4	--
Resident Fish		100.0	96.2	95.7	97.3	99.1	100.0	96.3	95.6	98.8
<i>Cyprinodon variegatus</i>	sheepshead minnow	81.9	38.8	47.9	43.1	49.1	76.1	54.9	36.5	35.8
<i>Fundulus heteroclitus</i>	mummichog	13.3	40.0	41.4	22.3	11.7	20.9	24.2	57.1	24.1
<i>Lucania parva</i>	rainwater killifish	4.8	17.5	6.4	31.9	38.3	3.0	17.3	1.6	38.9
<i>Fundulus majalis</i>	striped killifish	--	--	--	--	--	--	--	0.4	--
Transient Crustacean		--	2.5	2.5	1.9	0.9	--	1.9	4.0	0.6
<i>Callinectes sapidus</i>	blue crab	--	2.5	2.5	1.9	0.9	--	1.9	4.0	0.6
Transient Fish		--	1.2	1.8	0.8	--	--	1.8	--	0.6
<i>Menidia beryllina</i>	inland silverside	--	1.2	1.2	0.8	--	--	1.8	--	0.6
<i>Leiostomas xanthurus</i>	spot	--	--	0.6	--	--	--	--	--	--

(b)

Life History Group/Species	Common Name	Group Species Composition (%)									
		Site 2		Site 3		Site 4		Site 5		Site 6	
		Event 1 (114)	Event 2 (157)	Event 1 (68)	Event 2 (92)	Event 1 (228)	Event 2 (68)	Event 1 (115)	Event 2 (252)	Event 1 (525)	Event 2 (149)
Resident Crustacean		--	--	--	--	--	--	--	--	--	--
<i>Carcinus maenas</i> ⁺	green crab	--	--	--	--	--	--	--	--	--	--
Resident Fish		100	100	91.2	100	96.1	94.1	93.0	99.2	98.9	100
<i>Cyprinodon variegatus</i>	sheepshead minnow	76.3	86.0	45.6	33.7	42.2	69.1	61.7	34.5	48.6	51.0
<i>Fundulus heteroclitus</i>	mummichog	18.4	9.6	25.0	51.1	49.6	10.3	16.5	25.0	14.7	1.3
<i>Lucania parva</i>	rainwater killifish	5.3	4.5	20.6	15.2	4.3	14.7	14.8	39.7	35.6	47.7
<i>Fundulus majalis</i>	striped killifish	--	--	--	--	--	--	--	--	--	--
Transient Crustacean		--	--	5.9	--	3.1	--	5.2	0.4	1.1	--
<i>Callinectes sapidus</i>	blue crab	--	--	5.9	--	3.1	--	5.2	0.4	1.1	--
Transient Fish		--	--	2.9	--	0.8	5.9	1.7	0.4	--	--
<i>Menidia beryllina</i>	inland silverside	--	--	2.9	--	--	5.9	1.7	0.4	--	--
<i>Leiostomas xanthurus</i>	spot	--	--	--	--	0.8	--	--	--	--	--

(Table E-1, b continued)

Life History Group/Species	Common Name	Group Species Composition (%)							
		Site 8		Site 9		Site 10		Site 11	
		Event 1 (--)	Event 2 (67)	Event 1 (339)	Event 2 (286)	Event 1 (97)	Event 2 (155)	Event 1 (160)	Event 2 (164)
Resident Crustacean		--	--	--	--	1.0	--	--	--
<i>Carcinus maenas</i> ⁺	green crab	--	--	--	--	1.0	--	--	--
Resident Fish		--	100	96.8	95.8	88.7	100	99.4	98.2
<i>Cyprinodon variegatus</i>	sheepshead minnow	--	76.1	74.0	32.2	53.6	25.8	40.0	31.7
<i>Fundulus heteroclitus</i>	mummichog	--	20.9	17.4	32.2	35.1	71.0	30.6	17.7
<i>Lucania parva</i>	rainwater killifish	--	3.0	5.3	31.5	--	2.6	28.7	48.8
<i>Fundulus majalis</i>	striped killifish	--	--	--	--	--	0.6	--	--
Transient Crustacean		--	--	2.7	1.0	10.3	--	0.6	0.6
<i>Callinectes sapidus</i>	blue crab	--	--	2.7	1.0	10.3	--	0.6	0.6
Transient Fish		--	--	0.6	3.1	--	--	--	1.2
<i>Menidia beryllina</i>	inland silverside	--	--	0.6	3.1	--	--	--	1.2
<i>Leiostomas xanthurus</i>	spot	--	--	--	--	--	--	--	--

Appendix F. Vegetation frequency summarized by site.

Table F-1. Frequency of each plant species and non-vegetation cover type observed at ASIS in 2012. Data were summarized for each site and over all 451 plots. (NL) indicates standing non-living vegetation. '-' species not observed.

Cover Type		Site (no. of plots)									
Salinity Tolerance											
Species	Common Name	2 (50)	3 (50)	4 (53)	5 (50)	6 (50)	8 (49)	9 (50)	10 (49)	11 (50)	All (451)
Vegetation		49	35	40	48	31	44	39	41	31	358
High Salinity Tolerance		49	35	40	48	31	44	39	41	31	358
<i>Salicornia maritima</i>	glasswort	30	24	29	25	21	19	21	17	22	208
<i>Salicornia maritima</i> (NL)	glasswort (NL)	3	1	4	--	4	1	--	2	--	15
<i>Spartina alterniflora</i>	saltmarsh cordgrass	29	29	34	22	24	41	30	34	21	264
<i>Spartina alterniflora</i> (NL)	saltmarsh cordgrass (NL)	25	30	36	26	13	39	29	26	12	236
<i>Distichlis spicata</i>	spikegrass	26	9	14	19	8	8	14	15	15	128
<i>Distichlis spicata</i> (NL)	spikegrass (NL)	20	6	9	24	7	6	3	10	7	92
<i>Spartina patens</i>	salt meadow cordgrass	8	--	5	18	10	4	7	5	9	66
<i>Spartina patens</i> (NL)	salt meadow cordgrass (NL)	2	--	--	10	10	3	--	1	4	30
<i>Limonium carolinianum</i>	sea lavender	4	2	--	1	--	--	1	--	4	12
<i>Iva frutescens</i>	marsh elder	10	1	--	6	3	--	3	1	3	27
<i>Iva frutescens</i> (NL)	marsh elder (NL)	6	--	--	6	4	1	1	1	3	22
<i>Salicornia depressa</i>	Virginia glasswort	--	--	--	--	--	--	1	--	3	4
<i>Atriplex patula</i>	spear saltbush	1	--	--	--	--	3	--	1	--	5
<i>Juncus gerardii</i>	black grass	--	--	--	--	1	--	--	--	--	1
<i>Juncus gerardii</i> (NL)	black grass (NL)	--	--	--	--	1	--	--	--	--	1
<i>Juncus roemerianus</i>	black needle rush	2	--	--	--	--	--	--	--	--	2
<i>Juncus roemerianus</i> (NL)	black needle rush (NL)	2	--	--	--	--	--	--	--	--	2
<i>Ruppia maritima</i>	widgeon grass	--	1	1	--	--	--	--	--	--	2
<i>Suaeda maritima</i>	herbaceous seepweed	--	--	--	--	--	1	--	--	--	1

Table F-1. Frequency of each plant species and non-vegetation cover type observed at ASIS in 2012. Data were summarized for each site and over all 451 plots. (NL) indicates standing non-living vegetation. '-' species not observed (continued).

Cover Type		Site (no. of plots)									
Salinity Tolerance											
Species	Common Name	2 (50)	3 (50)	4 (53)	5 (50)	6 (50)	8 (49)	9 (50)	10 (49)	11 (50)	All (451)
Medium Salinity Tolerance		--	--	--	1	1	--	--	--	--	2
<i>Morella cerifera</i> (NL)	Southern bayberry (NL)	--	--	--	1	--	--	--	--	--	1
<i>Toxicodendron radicans</i>	poison ivy	--	--	--	--	1	--	--	--	--	1
Non-Vegetation		36	46	52	33	43	37	43	36	43	369
<i>water</i>	water	27	41	37	26	31	18	20	21	26	247
<i>bare ground</i>	bare ground	13	11	21	11	15	22	31	17	19	160
Incidental Cover		12	24	15	33	27	37	4	18	6	176
<i>Wrack & litter</i>	wrack & litter	11	24	15	33	27	36	4	17	6	173
<i>trash</i>	garbage / trash	1	--	--	2	1	1	--	1	--	6

Appendix G. Vegetation relative percent cover summarized by site.

Table G-1. Relative percent cover of each plant species and non-vegetation cover type observed at ASIS in 2012. Data were summarized for each site and over all 451 plots. (NL) indicates standing non-living vegetation.

Cover Type		Relative % Cover									
Salinity Tolerance		Site (No. of Plots)									
Species	Common Name	2 (50)	3 (50)	4 (53)	5 (50)	6 (50)	8 (49)	9 (50)	10 (49)	11 (50)	All (451)
Vegetation		58.7	35.9	31.3	56.1	44.5	46.0	41.0	58.8	40.6	45.9
High Salinity Tolerance		58.7	35.9	31.3	56.0	44.4	46.0	41.0	58.8	40.6	45.9
<i>Spartina alterniflora</i>	saltmarsh cordgrass	16.3	19.4	15.9	10.9	15.0	28.5	20.2	36.2	12.5	19.3
<i>Spartina alterniflora</i> (NL)	saltmarsh cordgrass (NL)	3.8	5.8	5.3	5.4	2.9	7.8	6.8	7.2	2.8	5.3
<i>Spartina patens</i>	salt meadow cordgrass	5.0	--	0.7	11.6	7.1	2.9	4.3	2.2	9.6	4.8
<i>Spartina patens</i> (NL)	salt meadow cordgrass (NL)	1.4	--	--	4.7	8.5	0.7	--	0.7	3.3	2.1
<i>Distichlis spicata</i>	spikegrass	13.7	2.6	3.4	7.5	1.3	1.5	2.4	3.8	2.8	4.5
<i>Distichlis spicata</i> (NL)	spikegrass (NL)	3.9	1.5	1.0	10.0	1.3	1.6	1.1	3.4	0.9	2.8
<i>Salicornia maritima</i>	glasswort	5.7	6.1	4.8	3.0	4.8	2.5	4.4	3.8	5.2	4.5
<i>Salicornia maritima</i> (NL)	glasswort (NL)	0.4	< 0.05	0.2	--	0.2	< 0.05	--	< 0.05	--	0.1
<i>Iva frutescens</i>	marsh elder	4.0	< 0.05	--	1.6	1.3	--	1.3	0.7	1.4	1.2
<i>Iva frutescens</i> (NL)	marsh elder (NL)	1.6	--	--	1.2	0.5	0.1	0.1	0.7	1.4	0.6
<i>Juncus roemerianus</i>	black needle rush	1.3	--	--	--	--	--	--	--	--	0.2
<i>Juncus roemerianus</i> (NL)	black needle rush (NL)	0.9	--	--	--	--	--	--	--	--	0.1
<i>Limonium carolinianum</i>	sea lavender	0.6	0.3	--	0.1	--	--	0.3	--	0.2	0.2
<i>Juncus gerardii</i>	black grass	--	--	--	--	0.3	--	--	--	--	< 0.05
<i>Juncus gerardii</i> (NL)	black grass (NL)	--	--	--	--	1.2	--	--	--	--	0.1
<i>Salicornia depressa</i>	Virginia glasswort	--	--	--	--	--	--	0.3	--	0.4	0.1
<i>Atriplex patula</i>	spear saltbush	0.1	--	--	--	--	0.2	--	0.1	--	< 0.05
<i>Ruppia maritima</i>	widgeon grass	--	< 0.05	0.1	--	--	--	--	--	--	< 0.05
<i>Suaeda maritima</i>	herbaceous seepweed	--	--	--	--	--	0.3	--	--	--	< 0.05

Table G-1. Relative percent cover of each plant species and non-vegetation cover type observed at ASIS in 2012. Data were summarized for each site and over all 451 plots. (NL) indicates standing non-living vegetation (continued).

Cover Type		Relative % Cover									
Salinity Tolerance		Site (No. of Plots)									
Species	Common Name	2 (50)	3 (50)	4 (53)	5 (50)	6 (50)	8 (49)	9 (50)	10 (49)	11 (50)	All (451)
Medium Salinity Tolerance		--	--	--	0.1	0.1	--	--	--	--	< 0.05
<i>Morella cerifera</i> (NL)	Southern bayberry (NL)	--	--	--	0.1	--	--	--	--	--	< 0.05
<i>Toxicodendron radicans</i>	poison ivy	--	--	--	--	0.1	--	--	--	--	< 0.05
Non-Vegetation		37.3	52.3	63.2	26.1	45.5	36.3	57.9	35.8	58.5	45.8
<i>water</i>	water	33.5	50.2	50.9	23.9	39.7	24.3	22.4	28.0	43.6	35.3
<i>bare ground</i>	bare ground	3.8	2.2	12.3	2.3	5.8	12.0	35.5	7.8	15.0	10.4
Incidental Cover		4.0	11.8	5.5	17.8	10.0	17.7	1.1	5.4	0.9	8.4
<i>Wrack & litter</i>	wrack & litter	3.7	11.8	5.5	17.7	9.7	17.6	1.1	5.3	0.9	8.3
<i>trash</i>	garbage / trash	0.3	--	--	0.1	0.3	0.1	--	0.1	--	0.1