



Salt Marsh Vegetation and Nekton Community Monitoring at Assateague Island National Seashore

2008 Summary Report

Natural Resource Report NPS/NCBN/NRDS—2010/065



ON THE COVER

Valentine salt marsh at Assateague Island National Seashore
Photograph by: Robin Baranowski

Salt Marsh Vegetation and Nekton Community Monitoring at Assateague Island National Seashore

2008 Summary Report

Natural Resource Report NPS/NCBN/NRDS—2010/065

Erika L. Patenaude

Penelope S. Pooler

National Park Service
Northeast Coastal and Barrier Network
University of Rhode Island
1 Greenhouse Rd
Kingston, RI 02881

August 2010

U.S. Department of the Interior
National Park Service
Natural Resource Program Center
Fort Collins, Colorado

The National Park Service, Natural Resource Program Center publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

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.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available from (<http://www.nps.gov/nero/science/>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/NRPM>).

Please cite this publication as:

Patenaude, E. L., and P. S. Pooler. 2010. Salt marsh vegetation and nekton community monitoring at Assateague Island National Seashore: 2008 summary report. Natural Resource Data Series NPS/NCBN/NRDS—2010/065. National Park Service, Fort Collins, Colorado.

Contents

	Page
Figures.....	v
Tables.....	vii
Executive Summary	ix
Acknowledgements.....	xi
Introduction.....	1
Methods.....	3
Permanent Site Selection	3
Nekton Sampling Station Selection and Data Collection	3
Vegetation Plot Selection and Data Collection	5
Data Summary	7
<i>Nekton</i>	7
<i>Vegetation</i>	7
Results.....	9
Nekton.....	9
Vegetation.....	16
Conclusions and Discussion	19
Nekton.....	19
Vegetation.....	19
Literature Cited	21
Appendix 1. Nekton species and community density at ASIS in 2008 summarized by site and sampling visit	23
Appendix 2. Nekton species richness at ASIS in 2008 summarized by site.....	27
Appendix 3. Coordinates for nekton station locations at ASIS in 2008	29

Appendix 4. Coordinates for vegetation plot locations at ASIS in 2008.....	35
--	----

Figures

	Page
Figure 1. Locations of permanent nekton and vegetation monitoring sites established by NCBN at Assateague Island National Seashore	4

Tables

	Page
Table 1. Sampling dates and total number of nekton sampling stations at nine marsh sites at ASIS in 2008.....	5
Table 2. Sampling dates and total number of vegetation plots sampled at nine marsh sites at ASIS in 2008.....	6
Table 3. Definition of standard cover type categories used in the Northeast Coastal and Barrier Network salt marsh vegetation monitoring program.....	6
Table 4. Modified Braun-Blanquet scale and corresponding midpoint values for determining percent cover of salt marsh vegetation.	7
Table 5. Nekton species and community composition (% catch) at ASIS in 2008.....	10
Table 6. Average density and standard deviation [individuals per 1 m ² ± SD (total count)] of nekton captured at ASIS in 2008.....	11
Table 7. Average density and standard deviation [individuals per 1 m ² ± SD (total count)] of nekton captured for each habitat type at ASIS in 2008.	12
Table 8. Estimated nekton species richness (Est. Species Richness ± SD) summarized by sampling visit at ASIS in 2008.	13
Table 9. Average length [mm ± SD (no. measured)] of nekton during each sample visit at ASIS in 2008.....	14
Table 10. Average values for physical characteristics [Average ± SD (no. of stations)] at nekton sampling stations at ASIS in 2008.	15
Table 11. Average percent cover (Average Cover % ± SD) and relative percent prevalence of each plant species and non-vegetation cover type at ASIS in 2008.	17

Executive Summary

The Northeast Coastal and Barrier Network (NCBN) is one of 32 networks of parks created by the Inventory and Monitoring Program (I&M Program) of the National Park Service. The I&M Program has two components, 1) to collect baseline ecological inventory datasets and 2) to implement *Vital Signs* monitoring, a long-term ecological monitoring program, in each of the Network parks. The Northeast Coastal and Barrier Network consists of eight parks linked by geography and shared ecological characteristics along the Northeastern Atlantic Coast. As part of the Vital Signs program, each Network has developed detailed protocols for monitoring a select number of Vital Signs, or ecological indicators. Because the majority of parks in the NCBN are coastal parks, salt marsh monitoring was chosen as a high priority and a protocol was developed for collecting long-term data on salt marsh vegetation and nekton (James-Pirri In Development-a,b).

This annual report summarizes the first year of data collected at Assateague Island National Seashore (ASIS) located in Maryland and Virginia. Fifty vegetation plots and a subset of pools, creeks and shoreline were sampled for nekton at nine marshes June-September, 2008. Monitoring data is to be collected at these same marsh sites biennially. Nekton in marsh pools, large tidal creeks, and shoreline habitats (all less than 1m deep) were sampled with a 1m² aluminum throw trap (Kushlan 1981, Sogard & Able 1991, Raposa and Roman 2001). Vegetation was monitored using 1m² plots and a revised Braun-Blanquet method (Kent and Coker 1992) to estimate percent cover of each vegetation species and non-vegetation cover type within each plot.

At the nine ASIS sites, 27 vegetation species along with 5 non-vegetation cover types were recorded during vegetation sampling in 2008. Non-vegetation cover types recorded included horse manure, wrack and litter, bare ground, water, and trash. Seventeen species of nekton were recorded at ASIS in 2008, including 15 fish species, 1 crab species, and 1 shrimp species. Examination of percent catch data indicates that four fish species account for approximately 94% of all nekton captured. The most prevalent species, sheepshead minnow (*Cyprinodon variegatus*), accounts for approximately 66% of all nekton recorded at ASIS in 2008. The other three species, common mummichog (*Fundulus heteroclitus*), rainwater killifish (*Lucania parva*), and inland Silverside (*Menidia beryllina*), account for approximately 10%, 9% and 9% respectively.

The information collected through this long-term monitoring program will equip park managers with scientific data to make informed decisions on both the aquatic and terrestrial resources they manage. This report summarizes the 2008 baseline data for ASIS salt marshes. Changes in salt marsh condition will be examined following data collection in 2010. By understanding the changes or trends occurring in salt marsh vegetation and nekton communities, managers will be able to better adapt and respond to these changes through their management practices.

Acknowledgements

We would like to thank Charles T. Roman and Mary-Jane James-Pirri for the development of the salt marsh vegetation and nekton monitoring protocols and Dennis Skidds for his work on the salt marsh monitoring database and data management support. We would also like to thank the 2008 salt marsh field crew members, Casey Nolan and Rachel Lux for their hard work and, of course, the Assateague Island National Seashore staff for providing support to the NCBN 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 funded by Congress in 2000. 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 ecological monitoring. Networks were required to develop a monitoring plan addressing the implementation of long-term monitoring of key ecological indicators or “vital signs.” 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 ecological health of park resources.

The Northeast Coastal and Barrier Network (NCBN) is made up of eight parks: Assateague Island National Seashore (ASIS, coastal Maryland and Virginia), Thomas Stone National Historic Site (THST, Charles County, MD), Cape Cod National Seashore (CACO, Cape Cod, MA), Gateway National Recreation Area (GATE, New York, NY and Sandy Hook, NJ), Fire Island National Seashore (FIIS, Long Island, NY), Sagamore Hill National Historic Site (SAHI, Oyster Bay, NY), Colonial National Historical Park (COLO, Virginia Peninsula), and George Washington Birthplace National Monument (GEWA, Westmoreland County, VA). 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 2008 according to two protocols developed by Pirri et al., *Monitoring Nekton in Salt Marshes: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network* and *Monitoring Salt Marsh Vegetation: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network* (In Development-a,b).

The objective of salt marsh vegetation and nekton monitoring is to identify long-term trends in the structure of these communities, which in turn should provide a better understanding of the current status and condition of salt marsh within the parks. These data will assist park managers in making informed decisions regarding the management and continued protection of this rare and valuable coastal resource.

Methods

Permanent Site Selection

Nine permanent 5-8 hectare salt marsh sites were selected for monitoring at ASIS (Fig. 1). The number of sites chosen within the park was based on the logistics and feasibility of sampling all sites within one summer. Marsh sites were chosen randomly from all salt marsh within a park, so that statistical inference could be extended to the entire park. Detailed information about the site selection process and sampling design can be found in the Salt Marsh Vegetation and Nekton Protocols (James-Pirri et al. In Development-a,b).

Both vegetation and nekton sampling will be conducted at these nine marshes every 2 years. In addition, sediment elevation data will be collected at four of these marshes on an annual basis.

Nekton Sampling Station Selection and Data Collection

Depending on available habitat, between 8 and 21 nekton sampling stations were established at each marsh site. Habitat types sampled included marsh pools/pannes, tidal creeks, and shoreline edge. If a marsh site had 15 or fewer pools, all pools within that site were sampled. If a marsh had many pools, a maximum of 15 were randomly selected for sampling. In addition to the pool stations sampled, three sampling stations were established along marsh creek and along shoreline edge habitats. All nekton sampling stations were randomly located along the perimeter of a pool, tidal creek, or shoreline, so that inference can apply to all fishable water within each site and can be biologically extended to the site as a whole. Nekton stations were sampled twice, once in early summer (June-July) and once in late summer (August – early September) (Table 1).

Nekton in marsh pools, large tidal creeks, and shoreline habitats (all less than 1m deep) were sampled with a 1m² aluminum throw trap (Kushlan 1981, Sogard and Able 1991, Raposa and Roman 2001). The throw trap is an enclosure sampler that has excellent efficiency and provides quantitative, repeatable results (Rozas and Minello 1997). The trap has an open top and bottom, is 0.5m in height and 1m square, and the sides are covered with 3mm (1/8 in) wire mesh. All nekton were collected from the trap with a 1mm mesh dip net that fit snugly within the opposite sides of the trap.

All fish and decapods were identified and enumerated. A representative number (up to 15 individuals) of each species collected was measured for length (fish – total length; crabs – carapace width; shrimp – total length). Once identified and measured, all organisms were returned to the location where they were collected.

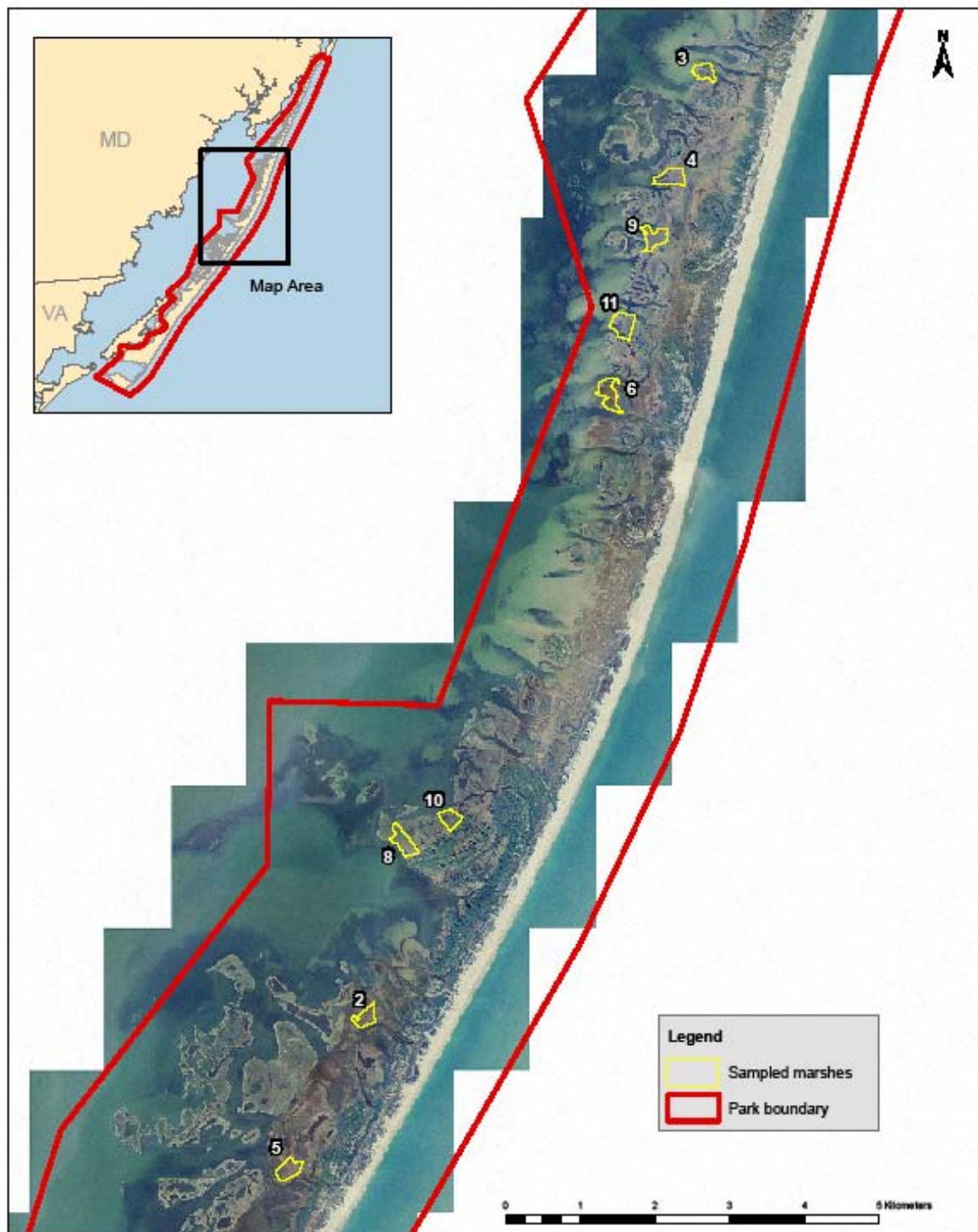


Figure 1. Locations of permanent nekton and vegetation monitoring sites established by NCBN at Assateague Island National Seashore (ASIS). These nine sites will be monitored biennially.

Table 1. Sampling dates and total number of nekton sampling stations at nine marsh sites at ASIS in 2008. Sampling stations are displayed by habitat type.

Site	Visit	Dates	Habitat			Total
			Tidal Creek	Pool/Panne	Shoreline	
2	1	7/1/2008	0	5	3	8
	2	9/15/2008	0	5	3	8
3	1	7/2/2008	3	13	3	19
	2	9/8/2008	3	13	3	19
4	1	7/3/2008	5	11	1	17
	2	9/9/2008	3	11	2	16
5	1	7/7/2008	0	12	3	15
	2	9/18/2008	0	14	3	17
6	1	7/8/2008	3	15	3	21
	2	9/12/2008	3	15	3	21
8	1	7/9/2008	3	15	3	21
	2	9/17/2008	2	15	2	19
9	1	7/10/2008	3	13	3	19
	2	9/10/2008	3	13	3	19
10	1	7/14/2008	3	15	3	21
	2	9/16/2008	3	15	3	21
11	1	7/15/2008	0	14	3	17
	2	9/11/2008	0	13	3	16

Vegetation Plot Selection and Data Collection

Vegetation sampling was conducted at each of the nine permanent marsh sites during July and August. Ten transects, extending from creek bank to upland, were randomly located within each marsh and 50 1m² plots were randomly placed along these transects. Each plot was visited once during the summer sampling season (Table 2).

For each plot, all vegetation species and non-vegetation cover types 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 2008.

Site	Dates	Total
2	7/21-23/2008	50
3	7/29/2008	50
4	7/30/2008	50
5	7/23/2008	51
6	7/28/2008	50
8	7/24/2008	50
9	7/30/2008	50
10	7/25/2008	50
11	7/31/2008	50

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

Live vascular plants (herbaceous and shrubs) identified by species.

Standing non-living vascular plants identified by species (*e.g.*, *S. alterniflora* 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.*, *Fucus*, *Ascophyllum*). 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

Species composition, average density, average length of nekton, and standard deviations were all calculated using standard formulae. The same is true of the average values of the physical characteristics calculated for each habitat type during each visit. Details can be found in the Analysis and Reporting Standard Operating Procedure of James-Pirri et al. (In Development-a). Species richness was calculated using the algorithm described in Heltshe and Forester (1983). An explanation and example of using the algorithm is provided in the Analysis and Reporting Standard Operating Protocol of James-Pirri et al. (In Development-a).

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 in the data was converted to the midpoint of the percent range it represented (Table 4) as described in Wikum and Shanholtzer (1978).

Table 4. Modified Braun-Blanquet scale and corresponding midpoint values for determining percent cover of salt marsh vegetation.

BB Value	Percent Cover	Midpoint
0	0%	0%
1	< 1%	0.5%
2	1 - 5%	3%
3	6 - 25%	15.5%
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, we rename it a ‘relative prevalence’ value. The calculation is essentially identical to that described in Wikum and Shanholtzer’s publication. Although Wikum and Shanholtzer (1978) present their importance value as a sum of the percent frequency and percent cover values, this report takes the average of these values so that relative prevalence is on a more readily interpretable percent scale. We estimated the relative percent prevalence for each species which is the average of the relative percent cover and the relative percent frequency.

Relative percent cover is the percent of all plots that each species or cover type covers relative to all other species and non-vegetation cover types present in the marsh plots. The sum of all relative percent cover values for all species and cover types equals 100%. Relative percent frequency is the number of plots where each species or cover type is present, relative to all other

species and non-vegetation cover types present. The sum of the relative percent frequency values for all species is 100%.

Taking the average of the relative percent cover and the relative percent frequency gives the relative percent prevalence for each species, or non-vegetation cover type present. Because the relative percent prevalence incorporates both percent frequency and percent cover, it is likely to differ substantially from the average percent cover for a given species or non-vegetation cover type. We also report the average percent cover of each species for all plots combined.

Lastly, if any identified vegetation species in the sample plots are 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, these species are noted in the vegetation table. Information about plants listed by each state as exotic, invasive, threatened, endangered, or rare is available online (USDA 2010). In some cases, more specific information may be available on state websites. Information about plants listed by the state of Maryland as exotic or invasive is available online (Maryland Invasive Species Council 2010). Information about plants listed by the state of Maryland as threatened, endangered, or rare can be obtained from the Maryland Natural Heritage Program (2010). Information about plants listed by the commonwealth of Virginia as exotic or invasive is available online (Virginia Department of Conservation and Recreation 2009). Information about plants listed by the commonwealth of Virginia as threatened, endangered, or rare can be obtained from an online report produced by the Virginia Department of Conservation and Recreation (Townsend 2009).

- ∞ If any species found in the sample plots are noted as being from one of these categories, plots with those categories of vegetation present will be noted in Appendix 4, the list of all vegetation sample plots and their respective Universal Transverse Mercator (UTM) coordinates.

Results

Nekton

Seventeen nekton species consisting of 15 fish and 2 decapod species were captured at ASIS during the summer of 2008 on nine salt marsh sites in creeks, pools, and shoreline edge combined. Examination of nekton species and composition (% catch) indicates that four fish species account for approximately 94% of all nekton recorded during summer sampling at ASIS in 2008 (Table 5). The most prevalent species, sheepshead minnow (*Cyprinodon variegatus*) accounts for approximately 66% of all nekton recorded. The other three species, common mummichog (*Fundulus heteroclitus*), rainwater killifish (*Lucania parva*), and inland silverside (*Menidia beryllina*), account for approximately 10%, 9% and 9% respectively. Community composition percentages show that during the first visit, fish comprised over 99% of all nekton caught and during the second visit, fish comprised approximately 93% of all nekton caught.

The average density of each species and community for each sampling visit is presented in Table 6. Sheepshead minnow (*C. variegatus*) had the highest density of all species captured in 2008, with common mummichog (*F. heteroclitus*), rainwater killifish (*L. parva*) and inland silverside (*M. beryllina*) following respectively. From what is known about the life history of fish and decapods, differences between sampling visits are expected, and this is the primary reason for sampling the nekton community twice each summer. Species and community densities for each sampling visit at each site can be found in Appendix 1.

Table 7 shows species and community density by sampling visit and habitat type (tidal creek, pool/panne or shoreline). The four species with the highest densities were the sheepshead minnow (*C. variegatus*), the common mummichog (*F. heteroclitus*), rainwater killifish (*L. parva*) and the inland silverside (*M. beryllina*) across all three habitats. There were some differences in species observed in each habitat. For example, summer flounder (*Paralichthys dentatus*) and Atlantic needlefish (*Stongylura marina*) were only caught in the tidal creeks, and American shad (*Alosa sapidissima*) were not found in pools/pannes on the marsh surface.

Table 5. Nekton species and community composition (% catch) at ASIS in 2008. Data are shown for each visit separately and both visits combined. n = total number of nekton caught during that visit. '*' indicates that only the genus or family could be confirmed. '-' indicates that a species was not present.

Community/Species	Common Name	Community/Species Composition (%)		
		Visit 1 (n = 5565)	Visit 2 (n = 2158)	Visits 1 & 2 (n = 7723)
Fish		99.4	93.2	97.7
<i>Cyprinodon variegatus</i>	Sheepshead Minnow	66.2	65.5	66.0
<i>Fundulus heteroclitus</i>	Common Mummichog	9.1	12.9	10.2
<i>Lucania parva</i>	Rainwater Killifish	9.6	8.5	9.3
<i>Menidia beryllina</i>	Inland Silverside	10.3	5.5	9.0
<i>Alosa sapidissima</i>	American Shad	1.5	0.1	1.1
<i>Leiostomas xanthurus</i>	Spot	1.2	0.1	0.9
<i>Fundulus species*</i>	Ray Finned Fish Genus*	0.6	-	0.4
<i>Anguilla rostrata</i>	American Eel	0.3	0.1	0.3
<i>Fundulus luciae</i>	Spotfin Killifish	0.3	0.1	0.2
Unknown Juvenile Fish	Unknown Juvenile Fish	0.2	-	0.1
<i>Fundulidae*</i>	Topminnow Family*	0.2	-	0.1
<i>Gobiosoma bosc</i>	Naked Goby	-	0.4	0.1
<i>Fundulus confluentus</i>	Marsh Killifish	< 0.05	-	< 0.05
<i>Paralichthys dentatus</i>	Summer Flounder	< 0.05	0.1	< 0.05
<i>Gambusia affinis</i>	Mosquitofish	< 0.05	-	< 0.05
<i>Stongylura marina</i>	Atlantic Needlefish	< 0.05	-	< 0.05
Decapods		0.6	6.8	2.3
<i>Palaemonetes pugio</i>	Daggerblade Grass Shrimp	0.4	6.4	2.1
<i>Callinectes sapidus</i>	Blue Crab	0.2	0.4	0.2

Table 6. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured at ASIS in 2008. ‘*’ indicates that only the genus or family could be confirmed. ‘-’ indicates that a species was not present. n = number of nekton stations sampled. Most stations were sampled during both visits. The difference in the number of stations sampled between visits was due to some stations being dry.

Community/Species	Common Name	Average Density [individuals per 1 m ² ± SD (total count)]		
		Visit 1 (n = 158)	Visit 2 (n = 156)	Visits 1 & 2 (n = 160)
Fish		35.0 ± 49.1 (5532)	12.9 ± 33.8 (2011)	24.0 ± 37.0 (7543)
<i>Cyprinodon variegatus</i>	Sheepshead Minnow	23.3 ± 43.5 (3681)	9.1 ± 27.9 (1413)	16.1 ± 32.0 (5094)
<i>Fundulus heteroclitus</i>	Common Mummichog	3.2 ± 7.0 (506)	1.8 ± 5.8 (278)	2.5 ± 4.6 (784)
<i>Lucania parva</i>	Rainwater Killifish	3.4 ± 8.7 (534)	1.2 ± 2.8 (183)	2.4 ± 5.6 (717)
<i>Menidia beryllina</i>	Inland Silverside	3.6 ± 12.2 (572)	0.8 ± 2.5 (119)	2.2 ± 6.4 (691)
<i>Alosa sapidissima</i>	American Shad	0.5 ± 5.8 (84)	< 0.05 (2)	0.3 ± 2.9 (86)
<i>Leiostomas xanthurus</i>	Spot	0.4 ± 3.8 (66)	< 0.05 (3)	0.2 ± 1.9 (69)
<i>Fundulus species*</i>	Ray Finned Fish Genus*	0.2 ± 2.2 (31)	-	0.1 ± 1.1 (31)
<i>Anguilla rostrata</i>	American Eel	0.1 ± 0.7 (18)	< 0.05 (1)	0.1 ± 0.4 (19)
<i>Fundulus luciae</i>	Spotfin Killifish	0.1 ± 0.5 (15)	< 0.05 (3)	0.1 ± 0.3 (18)
Unknown Juvenile Fish	Unknown Juvenile Fish	0.1 ± 0.9 (11)	-	< 0.05 (11)
<i>Fundulidae*</i>	Topminnow Family*	0.1 ± 0.7 (9)	-	< 0.05 (9)
<i>Gobiosoma bosc</i>	Naked Goby	-	0.1 ± 0.5 (8)	< 0.05 (8)
<i>Fundulus confluentus</i>	Marsh Killifish	< 0.05 (2)	-	< 0.05 (2)
<i>Paralichthys dentatus</i>	Summer Flounder	< 0.05 (1)	< 0.05 (1)	< 0.05 (2)
<i>Gambusia affinis</i>	Mosquitofish	< 0.05 (1)	-	< 0.05 (1)
<i>Stongylura marina</i>	Atlantic Needlefish	< 0.05 (1)	-	< 0.05 (1)
Decapods		0.2 ± 0.8 (33)	0.9 ± 4.1 (147)	0.6 ± 2.2 (180)
	Daggerblade Grass			
<i>Palaemonetes pugio</i>	Shrimp	0.2 ± 0.7 (24)	0.9 ± 4.0 (139)	0.5 ± 2.1 (163)
<i>Callinectes sapidus</i>	Blue Crab	0.1 ± 0.3 (9)	0.1 ± 0.2 (8)	0.1 ± 0.2 (17)
Total Nekton		35.2 ± 49.3 (5565)	13.8 ± 34.6 (2158)	24.6 ± 37.5 (7723)

Table 7. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured for each habitat type at ASIS in 2008. “*” indicates that the genus or family could be identified, but that the species identification was not confirmed. ‘-’ indicates that a species was not present. n = number of nekton stations sampled. The difference in the number of stations sampled between visits was due to some stations being dry.

Community/Species	Common Name	Average Density [individuals per 1 m ² ± SD (total count)]					
		Visit 1			Visit 2		
		Tidal Creek (n = 20)	Pool/Panne (n = 113)	Shoreline (n = 25)	Tidal Creek (n = 17)	Pool/Panne (n = 114)	Shoreline (n = 25)
Fish		37.7 ± 81.1 (754)	37.6 ± 42.6 (4249)	21.2 ± 42.8 (529)	20.8 ± 82.5 (354)	14.0 ± 23.6 (1595)	2.5 ± 7.0 (62)
<i>Cyprinodon variegatus</i>	Sheepshead Minnow	24.9 ± 81.4 (497)	25.3 ± 34.4 (2862)	12.9 ± 38.3 (322)	16.4 ± 67.7 (279)	9.6 ± 19.8 (1099)	1.4 ± 5.6 (35)
<i>Fundulus heteroclitus</i>	Common Mummichog	4.0 ± 9.2 (79)	3.3 ± 6.9 (372)	2.2 ± 5.0 (55)	3.5 ± 13.8 (60)	1.8 ± 4.2 (210)	0.3 ± 1.4 (8)
<i>Lucania parva</i>	Rainwater Killifish	4.4 ± 8.4 (87)	3.9 ± 9.6 (439)	0.3 ± 0.7 (8)	0.5 ± 1.1 (8)	1.5 ± 3.2 (171)	0.2 ± 0.5 (4)
<i>Menidia beryllina</i>	Inland Silverside	3.4 ± 6.4 (68)	4.1 ± 13.7 (460)	1.8 ± 7.8 (44)	0.1 ± 0.3 (2)	1.0 ± 2.8 (112)	0.2 ± 1.0 (5)
<i>Alosa sapidissima</i>	American Shad	0.1 ± 0.4 (2)	-	3.3 ± 14.5 (82)	-	-	0.1 ± 0.4 (2)
<i>Leiostomas xanthurus</i>	Spot	0.3 ± 0.6 (5)	0.5 ± 4.5 (57)	0.2 ± 0.5 (4)	0.2 ± 0.5 (3)	-	-
<i>Fundulus species*</i>	Ray Finned Fish Genus*	0.2 ± 0.7 (3)	0.2 ± 2.6 (28)	-	-	-	-
<i>Anguilla rostrata</i>	American Eel	0.4 ± 1.6 (8)	0.1 ± 0.4 (9)	< 0.05 (1)	0.1 ± 0.2 (1)	-	-
<i>Fundulus luciae</i>	Spotfin Killifish	0.2 ± 0.7 (3)	0.1 ± 0.5 (12)	-	-	< 0.05 (3)	-
Unknown Juvenile Fish	Unknown Juvenile Fish	-	-	0.4 ± 2.2 (11)	-	-	-
<i>Fundulidae*</i>	Topminnow Family*	-	0.1 ± 0.8 (9)	-	-	-	-
<i>Gobiosoma bosc</i>	Naked Goby	-	-	-	-	-	0.3 ± 1.2 (8)
<i>Fundulus confluentus</i>	Marsh Killifish	-	-	0.1 ± 0.4 (2)	-	-	-
<i>Paralichthys dentatus</i>	Summer Flounder	0.1 ± 0.2 (1)	-	-	0.1 ± 0.2 (1)	-	-
<i>Gambusia affinis</i>	Mosquitofish	-	< 0.05 (1)	-	-	-	-
<i>Stongylura marina</i>	Atlantic Needlefish	0.1 ± 0.2 (1)	-	-	-	-	-
Decapods		0.6 ± 1.3 (11)	0.1 ± 0.5 (14)	0.3 ± 1.2 (8)	0.2 ± 0.5 (3)	0.9 ± 3.9 (101)	1.7 ± 5.9 (43)
<i>Palaemonetes pugio</i>	Daggerblade Grass Shrimp	0.3 ± 0.9 (6)	0.1 ± 0.5 (11)	0.3 ± 1.2 (7)	0.1 ± 0.5 (2)	0.8 ± 3.8 (96)	1.6 ± 5.9 (41)
<i>Callinectes sapidus</i>	Blue Crab	0.3 ± 0.7 (5)	< 0.05 (3)	< 0.05 (1)	0.1 ± 0.2 (1)	< 0.05 (5)	0.1 ± 0.3 (2)
Total Nekton		38.3 ± 81.8 (765)	37.7 ± 42.8 (4263)	21.5 ± 42.7 (537)	21.0 ± 82.5 (357)	14.9 ± 25.1 (1696)	4.2 ± 8.8 (105)

Another summary measure we examined for these data, species richness, provided additional information about the extent of variability over the two visits. These results are consistent with those in the tables above in that they show a substantial decrease in both number of observed species and the estimated species richness between visit 1 and visit 2 (Table 8). Because the majority of the data were collected at identical locations within each site, variability due to microhabitat differences has been minimized and these results represent a best estimate of difference between visits. This estimated decrease of 35% in species richness between the two sampling visits provides a baseline for future trend analyses at ASIS. Species richness information for each site at ASIS, summarized over both visits, can be found in Appendix 2.

Table 8. Estimated nekton species richness (Est. Species Richness $\pm$ SD) summarized by sampling visit at ASIS in 2008.

Visit	No. of Stations	Observed No. of Species	Est. Species Richness + SD
1	158	17	23.0 $\pm$ 2.4
2	156	12	15.0 $\pm$ 1.7

Average length of each species, is summarized in Table 9. The four most prevalent species, *C. variegatus*, *F. heteroclitus*, *L. parva*, and *M. beryllina*, all showed an increase in length from visit 1 to visit 2 (Table 9). There were three species that were caught during both sampling visits that showed a decrease in length. Each of these species, *A. sapidissima*, *C. sapidus*, and *P. pugio* were caught in low numbers during one or both visits making these overall estimates less reliable (Table 9). Two of these species, *C. sapidus*, and *P. pugio*, are decapods and cannot be grouped with fish in terms of morphological changes within season.

Physical characteristics of each nekton sampling station were recorded for each station during each visit. These measures provide limited insight into differences between habitats and visits that may affect nekton (Table 10). Currently, these data are collected in a manner that may help to explain anomalies in nekton observed at a particular location during a specific visit. These parameters would need to be measured over the course of the field season in order to lend any real insight into observed changes in the nekton community.

Table 9. Average length [mm $\pm$ SD (no. measured)] of nekton during each sample visit at ASIS in 2008. Length data for each species was summarized over all stations sampled during each visit. '*' indicates that only the genus or family could be confirmed. '-' indicates that a species was not present.

Community/Species	Common Name	Average Length [mm ± SD (no. measured)]	
		Visit 1	Visit 2
Fish			
<i>Alosa sapidissima</i>	American Shad	57.1 ± 21.1 (27)	33.5 ± 2.1 (2)
<i>Anguilla rostrata</i>	American Eel	65.3 ± 12.5 (16)	136.0 (1)
		23.1 ± 7.7	27.4 ± 10.6
<i>Cyprinodon variegatus</i>	Sheepshead Minnow	(1217)	(637)
<i>Fundulidae*</i>	Topminnow Family*	11.4 ± 1.0 (9)	-
<i>Fundulus confluentus</i>	Marsh Killifish	80.5 ± 2.1 (2)	-
		33.2 ± 17.0	36.5 ± 11.2
<i>Fundulus heteroclitus</i>	Common Mummichog	(395)	(220)
<i>Fundulus luciae</i>	Spotfin Killifish	28.4 ± 11.5 (15)	54.0 ± 29.9 (3)
<i>Fundulus species*</i>	Ray Finned Fish Genus*	13.2 ± 3.5 (18)	-
<i>Gambusia affinis</i>	Mosquitofish	44.0 (1)	-
<i>Gobiosoma bosc</i>	Naked Goby	-	27.8 ± 7.2 (8)
			135.7 ± 15.9
<i>Leiostomas xanthurus</i>	Spot	48.9 ± 25.4 (33)	(3)
			24.2 ± 4.5
<i>Lucania parva</i>	Rainwater Killifish	20.0 ± 4.1 (385)	(173)
			30.3 ± 8.2
<i>Menidia beryllina</i>	Inland Silverside	25.0 ± 7.7 (308)	(113)
	Daggerblade Grass		24.1 ± 4.7
<i>Palaemonetes pugio</i>	Shrimp	33.0 ± 12.2 (24)	(109)
<i>Paralichthys dentatus</i>	Summer Flounder	132.0 (1)	171.0 (1)
<i>Stongylura marina</i>	Atlantic Needlefish	100.0 (1)	-
Unidentified Juvenile Fish	Unidentified Juvenile Fish	20.1 ± 2.9 (11)	-
Decapods			
<i>Callinectes sapidus</i>	Blue Crab	78.0 ± 16.6 (9)	65.6 ± 41.4 (8)
	Daggerblade Grass		24.1 ± 4.7
<i>Palaemonetes pugio</i>	Shrimp	33.0 ± 12.2 (24)	(109)

Table 10. Average values for physical characteristics [Average $\pm$ SD (no. of stations)] at nekton sampling stations at ASIS in 2008. Data are summarized over all nine marshes for each habitat type within each visit separately.

Variable	Average $\pm$ SD (no. of stations)					
	Visit 1			Visit 2		
	Tidal Creek	Pool	Shoreline	Tidal Creek	Pool	Shoreline
Depth (cm)	28.9 $\pm$ 14.4 (20)	17.2 $\pm$ 9.8 (112)	31.0 $\pm$ 11.8 (25)	25.8 $\pm$ 15.8 (17)	18.1 $\pm$ 10.9 (114)	34.6 $\pm$ 16.9 (25)
Temp ($^{\circ}$ C)	28.5 $\pm$ 2.8 (20)	29.3 $\pm$ 3.5 (111)	27.2 $\pm$ 1.7 (25)	24.7 $\pm$ 3.8 (17)	23.4 $\pm$ 3.1 (113)	23.4 $\pm$ 3.2 (25)
Salinity (ppt)	30.5 $\pm$ 1.9 (20)	33.3 $\pm$ 5.0 (112)	30.1 $\pm$ 1.7 (24)	34.8 $\pm$ 1.9 (17)	37.8 $\pm$ 5.1 (114)	34.7 $\pm$ 2.4 (25)

Vegetation

Twenty-seven vegetation species along with five non-vegetation cover types were recorded at nine salt marsh sites during vegetation sampling at ASIS in 2008 (Table 11). None of the identified vegetation species in the sample plots are listed by the USDA, the state of Maryland, or the state of Virginia as exotic, invasive, threatened, endangered, or rare. Non-vegetation cover types recorded included horse manure, bare ground, water, wrack and litter, and trash. The average percent cover and the relative percent prevalence of each species or non-vegetation cover type are also shown.

Data are sorted by average percent cover of living vegetation species. Average percent cover of non-living vegetation is also shown by species. As explained in the Data Summary section, the relative percent prevalence combines information about how much of each site each species or cover type covers relative to all other cover types present and how frequently it appears throughout the site relative to all other cover types present. The species with the highest living percent cover, *S. alterniflora*, dwarfs the percent cover of all other species at 50.1 ± 37.7 , but its relative percent prevalence, 28.7, while still high, is substantially lower. This is an indication that the patchy growing pattern of *S. alterniflora*, which has been documented to thrive in low marsh zones closer to coastal waters, (Bertness 1991) decreased its overall relative percent prevalence. In contrast, *S. europaea* has a substantially higher relative percent prevalence, 5.9, than its low average percent cover, 2.2 ± 5.0 indicating that although it does not cover a large proportion of the sites sampled at ASIS, it is well dispersed throughout the sites where it is found (Table 11).

Table 11. Average percent cover (Average Cover % $\pm$ SD) and relative percent prevalence of each plant species and non-vegetation cover type at ASIS in 2008. Data were summarized over all 452 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). (NL) indicates standing non-living vegetation.

Species/Cover Type	Common Name	Average Cover % $\pm$ SD	Relative Prevalence %
<i>Spartina alterniflora</i>	Saltmarsh Cordgrass	50.1 $\pm$ 37.7	28.7
<i>S. alterniflora</i> (NL)	Saltmarsh Cordgrass (NL)	3.1 $\pm$ 5.5	7.5
Water		13.9 $\pm$ 30.3	7.9
<i>Spartina patens</i>	Salt Meadow Cordgrass	12.9 $\pm$ 26.6	8.2
<i>S. patens</i> (NL)	Salt Meadow Cordgrass (NL)	1.6 $\pm$ 5.9	2.1
<i>Distichlis spicata</i>	Spikegrass	9.0 $\pm$ 17.4	8.1
<i>D. spicata</i> (NL)	Spikegrass (NL)	2.9 $\pm$ 6.6	4.3
Bare Ground		8.2 $\pm$ 17.1	8.8
Wrack/Litter		6.5 $\pm$ 13.5	8.4
<i>Iva frutescens</i>	Marsh Elder	2.4 $\pm$ 12.2	1.6
<i>I. frutescens</i> (NL)	Marsh Elder (NL)	0.3 $\pm$ 2.5	0.4
<i>Salicornia europaea</i>	Glasswort	2.2 $\pm$ 5.0	5.9
<i>S. europaea</i> (NL)	Glasswort	0.6 $\pm$ 2.7	2.1
<i>Limonium carolinianum</i>	Sea Lavender	0.9 $\pm$ 4.6	1.3
<i>Lythrum lineare</i> (NL)	Saltmarsh Loosestrife	0.8 $\pm$ 3.9	1.8
<i>Ruppia maritima</i>	Widgeon Grass	0.6 $\pm$ 6.0	0.4
<i>R. maritima</i> (NL)	Widgeon Grass (NL)	0.2 $\pm$ 3.5	0.1
<i>Salicornia virginica</i>	Virginia Glasswort	0.4 $\pm$ 4.4	0.3
<i>S. virginica</i> (NL)	Virginia Glasswort (NL)	< 0.05	0.1
<i>Festuca rubra</i>	Red Fescue	0.2 $\pm$ 4.1	0.1
<i>Baccharis halimifolia</i>	Salt Marsh Elder	0.2 $\pm$ 2.5	0.1
<i>Juncus gerardii</i>	Black Grass	0.1 $\pm$ 1.9	0.2
<i>Toxicodendron radicans</i>	Poison Ivy	0.1 $\pm$ 1.9	0.1
Trash		0.1 $\pm$ 1.1	0.2
Unidentified Plant	Unidentified Plant	0.1 $\pm$ 1.8	0.1
<i>Pinus taeda</i>	Loblolly Pine	0.1 $\pm$ 1.8	0.1
<i>Smilax rotundifolia</i>	Common Greenbriar	0.1 $\pm$ 1.0	0.1
<i>S. rotundifolia</i> (NL)	Common Greenbriar (NL)	< 0.05	< 0.05
<i>Myrica pensylvanica</i>	Northern Bayberry	0.1 $\pm$ 1.0	0.1
<i>Andropogon virginicus</i>	Broom Sedge	< 0.05	0.1
<i>Eleocharis species</i>	Spikerush species	< 0.05	0.1
Horse Manure		< 0.05	0.2
<i>Juncus roemerianus</i>	Black Needle Rush	< 0.05	< 0.05
<i>J. roemerianus</i> (NL)	Black Needle Rush (NL)	0.1 $\pm$ 3.0	0.1
<i>Myrica cerifera</i>	Wax Myrtle	< 0.05	< 0.05
<i>Vitis rotundifolia</i>	Muscadine Grape	< 0.05	< 0.05
<i>Samolus parviflorus</i>	Water pimpernel	< 0.05	0.1
<i>Panicum virgatum</i>	Switchgrass	< 0.05	0.1
<i>Solidago sempervirens</i>	Seaside Goldenrod	< 0.05	0.1
<i>Carex Species</i>	Sedge Species	< 0.05	< 0.05
<i>Dichanthelium acuminatum</i>	Bushy Panicgrass	< 0.05	< 0.05
<i>Scirpus americanus</i>	Olney Three-square	< 0.05	< 0.05

Conclusions and Discussion

Nekton

The data summarized above show that the ASIS salt marsh provides habitat for a diverse and abundant nekton community. One of the most notable results of the 2008 sampling season was the high nekton densities and large species richness values found during the first sampling visit and the extent of decrease in these values from the first to the second sampling visit. These seasonal differences are to be expected, but the extent of change between visits will be one of the variables monitored over time in looking for trends. Extent of seasonal change in abundance, species richness and nekton community structure is subject to variability due to expected year to year climate differences. This annual variability will make trends difficult to isolate in the short term. Long term trends in sea-level rise associated with climate change, however, are likely to result in identifiable changes in the extent of seasonal difference in nekton density and species richness as well as differences in the variables themselves. With this goal in mind, the extensive nekton data collected at ASIS in 2008 provide an informative baseline to which future data will be compared.

Vegetation

This first year of vegetation monitoring at ASIS provides essential information about the species present and how prevalent they are. These data also include information about non-vegetation cover types such as bare ground and standing water which will be important to monitor over time. Because salt marshes are located in coastal areas and many of the plant species are sensitive to subtle changes in soil salinity and saturation, changes in the spatial distribution of some species will be important primary indicators of change in salt marsh condition. Trends in the spatial distribution of vegetation species and prevalence of bare ground and water will also provide information about changes in the overall condition of the salt marsh and whether or not it may transition to mud flat due to sea-level rise and climate change.

This first year of data at ASIS establishes a baseline for monitoring trends in vegetation community structure and spatial distribution of both vegetation species and non-vegetation cover types. Long-term monitoring of salt marsh vegetation will allow us to test hypotheses about whether apparent changes are due to year to year variability or represent significant trends.

Literature Cited

- Bertness, M.D. 1991. Zonation of *Spartina Patens* and *Spartina Alterniflora* in New England Salt Marsh. *Ecology* 20: 138-148.
- Heltshe, J.F. and N.E. Forrester. 1983. Estimating species richness using the jackknife procedure. *Biometrics* 39:1-11.
- James-Pirri, M.J., C.T. Roman, and K.B. Raposa. In Development-a. Monitoring nekton in Salt Marshes - A Protocol for the National Park Service's Long-Term Monitoring Program, Northeast Coastal and Barrier Network. Submitted to Sara Stevens, National Park Service Northeast Coastal and Barrier Network.
- James-Pirri, M.J., C.T. Roman, and J.F. Heltshe. In Development-b. Monitoring Salt Marsh Vegetation - A Protocol for the National Park Service's Long-Term Monitoring Program, Northeast Coastal and Barrier Network. Submitted to Sara Stevens, National Park Service Northeast Coastal and Barrier Network.
- Kent, M., and P. Coker. 1992. Vegetation description and analysis: a practical approach. J. Wiley and Sons, Ltd., Chichester, England.
- Kushlan, J.A. 1981. Sampling characteristics of enclosure fish traps. *Transactions of the American Fisheries Society* 110:557-562.
- Maryland Invasive Species Council. 2010. Terrestrial Plants. http://www.mdinvasivesp.org/list_terrestrial_plants.html
- Maryland Natural Heritage Program. 2010. Rare, Threatened and Endangered Plants of Maryland. Maryland Department of Natural Resources, Wildlife and Heritage Service, Annapolis, Maryland.
- Raposa, K.B. and C.T. Roman. 2001. Seasonal habitat-use patterns of nekton in a tide-restricted and unrestricted New England salt marsh. *Wetlands* 21: 451-461.
- Rozas, L.P. and T.J. Minello. 1997. Estimating densities of small fishes and decapod crustaceans in shallow estuarine habitats: a review of sampling design with focus on gear selection. *Estuaries* 20:199-213.
- Sogard, S.M. and K.W. Able. 1991. A comparison of eelgrass, sea lettuce macroalgae, and marsh creeks as habitats for epibenthic fishes and decapods. *Estuarine, Coastal and Shelf Science* 33:501-519.

- Stevens, S., B. Milstead, M. Albert, G. Entsminger. 2005. Northeast Coastal and Barrier Network Vital Signs Monitoring Plan. Technical Report NPS/NER/NRTR--2005/025. National Park Service. Boston, Massachusetts.
- Townsend, J.F. 2009. Natural Heritage Resources of Virginia: Rare Plants. Natural Heritage Technical Report 09-07. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, Virginia. Unpublished report.
- United States Department of Agriculture. 2010. Natural Resources Conservation Service. Plants Database. <http://plants.usda.gov/>
- Virginia Department of Conservation and Recreation. 2009. Division of Natural Heritage. Invasive Alien Plant Species of Virginia. http://www.dcr.virginia.gov/natural_heritage/documents/invlist.pdf
- Wikum, D.A., G.F. Shanholtzer. 1978. Application of the Braun-Blanquet Cover-Abundance Scale for Vegetation Analysis in Land Development Studies. 2: 323-329.

Appendix 1. Nekton species and community density at ASIS in 2008 summarized by site and sampling visit

Table 1. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured for each site and visit at ASIS in 2008. ‘*’ indicates that the genus or family could be identified, but that the species identification was not confirmed. ‘-’ indicates that a species was not present.

Community/Species	Common Name	Average Density [individuals per 1 m ² ± SD (total count)]					
		Site 2		Site 3		Site 4	
		Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
Fish		42.4 ± 68.8 (339)	8.6 ± 8.9 (69)	35.1 ± 25.5 (666)	8.3 ± 13 (157)	39.4 ± 45.6 (669)	13.6 ± 29.0 (218)
<i>Cyprinodon variegatus</i>	Sheepshead Minnow	34.8 ± 63.1 (278)	7.5 ± 7.3 (60)	21.5 ± 18.1 (409)	4.6 ± 8.3 (87)	32.4 ± 42.9 (550)	11.6 ± 26.2 (186)
<i>Fundulus heteroclitus</i>	Common Mummichog	1.0 ± 2.4 (8)	0.3 ± 0.7 (2)	2.3 ± 2.8 (43)	1.1 ± 2.4 (21)	2.8 ± 3.2 (47)	0.8 ± 1.2 (12)
<i>Lucania parva</i>	Rainwater Killifish	0.5 ± 0.8 (4)	0.4 ± 0.5 (3)	4.3 ± 7.3 (81)	0.2 ± 0.5 (4)	1.7 ± 3.4 (29)	0.9 ± 2.2 (14)
<i>Menidia beryllina</i>	Inland Silverside	2.4 ± 5.2 (19)	0.5 ± 1.4 (4)	6.6 ± 11.9 (125)	2.3 ± 5.2 (43)	2.4 ± 6.3 (40)	0.4 ± 1.3 (6)
<i>Alosa sapidissima</i>	American Shad	-	-	0.1 ± 0.5 (2)	-	-	-
<i>Leiostomas xanthurus</i>	Spot	-	-	0.3 ± 0.7 (5)	-	-	-
<i>Fundulus species</i>	Ray Finned Fish Genus*	3.5 ± 9.9 (28)	-	-	-	0.2 ± 0.7 (3)	-
<i>Anguilla rostrata</i>	American Eel	0.3 ± 0.7 (2)	-	0.1 ± 0.2 (1)	-	-	-
<i>Fundulus luciae</i>	Spotfin Killifish	-	-	-	-	-	-
Unknown Juvenile Fish	Unknown Juvenile Fish	-	-	-	-	-	-
<i>Fundulidae</i>	TopminnowFamily*	-	-	-	-	-	-
<i>Gobiosoma bosc</i>	Naked Goby	-	-	-	0.1 ± 0.5 (2)	-	-
<i>Fundulus confluentus</i>	Marsh Killifish	-	-	-	-	-	-
<i>Paralichthys dentatus</i>	Summer Flounder	-	-	-	-	-	-
<i>Gambusia affinis</i>	Mosquitofish	-	-	-	-	-	-
<i>Stongylura marina</i>	Atlantic Needlefish	-	-	-	-	-	-
Decapod		-	2.6 ± 6.6 (21)	0.4 ± 1.4 (7)	0.8 ± 3.0 (15)	0.1 ± 0.5 (2)	0.9 ± 3.8 (15)
<i>Palaemonetes pugio</i>	Daggerblade Grass Shrimp	-	2.4 ± 6.3 (19)	0.3 ± 1.4 (6)	0.7 ± 3.0 (14)	0.1 ± 0.2 (1)	0.9 ± 3.5 (14)
<i>Callinectes sapidus</i>	Blue Crab	-	0.3 ± 0.5 (2)	0.1 ± 0.2 (1)	0.1 ± 0.2 (1)	0.1 ± 0.2 (1)	0.1 ± 0.3 (1)
Total Nekton		42.4 ± 68.8 (339)	11.3 ± 14.5 (90)	35.4 ± 25.1 (673)	9.1 ± 13.1 (172)	39.5 ± 45.5 (671)	14.6 ± 32.5 (233)

Table 1 con't.

Community/Species	Common Name	Average Density [individuals per 1 m ² ± SD (total count)]					
		Site 5		Site 6		Site 8	
		Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
Fish		39.3 ± 46.6 (589)	9.4 ± 9.6 (160)	26.6 ± 26.5 (559)	7.4 ± 11.0 (156)	21.8 ± 30.9 (458)	12.6 ± 18.3 (239)
<i>Cyprinodon variegatus</i>	Sheepshead Minnow	32.6 ± 41.2 (489)	7.3 ± 7.2 (124)	17.0 ± 18.8 (357)	5.0 ± 9.0 (106)	9.1 ± 16.9 (191)	6.7 ± 13.2 (128)
<i>Fundulus heteroclitus</i>	Common Mummichog	3.2 ± 5.5 (48)	1.6 ± 4.6 (27)	1.9 ± 2.5 (40)	0.8 ± 1.8 (16)	6.2 ± 11.9 (130)	3.3 ± 5.9 (63)
<i>Lucania parva</i>	Rainwater Killifish	2.5 ± 4.8 (38)	0.5 ± 1.1 (9)	4.1 ± 7.0 (86)	1.5 ± 2.6 (31)	2.0 ± 6.2 (41)	1.4 ± 2.1 (27)
<i>Menidia beryllina</i>	Inland Silverside	0.2 ± 0.4 (3)	-	0.2 ± 0.9 (5)	-	3.8 ± 9.0 (79)	1.1 ± 2.6 (20)
<i>Alosa sapidissima</i>	American Shad	-	-	-	0.1 ± 0.4 (2)	-	-
<i>Leiostomas xanthurus</i>	Spot	0.1 ± 0.3 (1)	-	2.3 ± 10.5 (48)	-	0.2 ± 0.6 (4)	-
<i>Fundulus species</i>	Ray Finned Fish Genus*	-	-	-	-	-	-
<i>Anguilla rostrata</i>	American Eel	0.1 ± 0.3 (1)	-	0.6 ± 1.6 (12)	< 0.05 (1)	-	-
<i>Fundulus luciae</i>	Spotfin Killifish	-	-	0.4 ± 1.1 (9)	-	0.1 ± 0.4 (2)	0.1 ± 0.2 (1)
Unknown Juvenile Fish	Unknown Juvenile Fish	-	-	-	-	0.5 ± 2.4 (11)	-
<i>Fundulidae</i>	TopminnowFamily*	0.6 ± 2.3 (9)	-	-	-	-	-
<i>Gobiosoma bosc</i>	Naked Goby	-	-	-	-	-	-
<i>Fundulus confluentus</i>	Marsh Killifish	-	-	-	-	-	-
²⁴ <i>Paralichthys dentatus</i>	Summer Flounder	-	-	< 0.05 (1)	-	-	-
<i>Gambusia affinis</i>	Mosquitofish	-	-	-	-	-	-
<i>Stongylura marina</i>	Atlantic Needlefish	-	-	< 0.05 (1)	-	-	-
Decapod		0.1 ± 0.3 (1)	0.1 ± 0.2 (1)	0.3 ± 1.1 (6)	0.2 ± 0.6 (5)	-	0.1 ± 0.2 (1)
<i>Palaemonetes pugio</i>	Daggerblade Grass Shrimp	0.1 ± 0.3 (1)	0.1 ± 0.2 (1)	0.2 ± 0.9 (5)	0.2 ± 0.6 (4)	-	-
<i>Callinectes sapidus</i>	Blue Crab	-	-	< 0.05 (1)	< 0.05 (1)	-	0.1 ± 0.2 (1)
Total Nekton		39.3 ± 46.5 (590)	9.5 ± 9.5 (161)	26.9 ± 26.6 (565)	7.7 ± 10.9 (161)	21.8 ± 30.9 (458)	12.6 ± 18.3 (240)

Table 1 con't.

Community/Species	Common Name	Average Density [individuals per 1 m ² ± SD (total count)]					
		Site 9		Site 10		Site 11	
		Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
Fish		50.9 ± 84.1 (968)	40.5 ± 84.2 (770)	20.5 ± 26.9 (430)	7.0 ± 15.4 (148)	50.2 ± 68.8 (854)	5.9 ± 8.1 (94)
<i>Cyprinodon variegatus</i>	Sheepshead Minnow	38.1 ± 83.5 (724)	32.8 ± 70.1 (624)	10.8 ± 17.5 (227)	3.5 ± 8.2 (73)	26.8 ± 55.2 (456)	1.6 ± 2.3 (25)
<i>Fundulus heteroclitus</i>	Common Mummichog	4.8 ± 11.8 (92)	5.3 ± 13.3 (100)	3.4 ± 6.5 (72)	1.3 ± 4.7 (28)	1.5 ± 2.7 (26)	0.6 ± 1.8 (9)
<i>Lucania parva</i>	Rainwater Killifish	1.0 ± 3.1 (19)	1.5 ± 2.8 (28)	1.9 ± 3.7 (40)	1.3 ± 3.1 (27)	11.5 ± 20.5 (196)	2.5 ± 5.9 (40)
<i>Menidia beryllina</i>	Inland Silverside	3.2 ± 9.3 (60)	0.9 ± 2.0 (18)	3.3 ± 9.0 (70)	0.7 ± 1.3 (14)	10.1 ± 29.3 (171)	0.9 ± 3.0 (14)
<i>Alosa sapidissima</i>	American Shad	3.8 ± 16.5 (72)	-	0.5 ± 2.2 (10)	-	-	-
<i>Leiostomas xanthurus</i>	Spot	0.1 ± 0.2 (1)	-	0.3 ± 1.2 (7)	0.1 ± 0.5 (3)	-	-
<i>Fundulus species</i>	Ray Finned Fish Genus*	-	-	-	-	-	-
<i>Anguilla rostrata</i>	American Eel	-	-	-	-	0.1 ± 0.5 (2)	-
<i>Fundulus luciae</i>	Spotfin Killifish	-	-	0.1 ± 0.7 (3)	0.1 ± 0.4 (2)	0.1 ± 0.2 (1)	-
Unknown Juvenile Fish	Unknown Juvenile Fish	-	-	-	-	-	-
<i>Fundulidae</i>	TopminnowFamily*	-	-	-	-	-	-
<i>Gobiosoma bosc</i>	Naked Goby	-	-	-	-	-	0.4 ± 1.5 (6)
<i>Fundulus confluentus</i>	Marsh Killifish	-	-	-	-	0.1 ± 0.5 (2)	-
<i>Paralichthys dentatus</i>	Summer Flounder	-	-	-	< 0.05 (1)	-	-
<i>Gambusia affinis</i>	Mosquitofish	-	-	< 0.05 (1)	-	-	-
<i>Stongylura marina</i>	Atlantic Needlefish	-	-	-	-	-	-
Decapod		0.3 ± 0.7 (5)	2.5 ± 7.5 (47)	< 0.05 (1)	< 0.05 (1)	0.6 ± 1.2 (11)	2.6 ± 6.8 (41)
<i>Palaemonetes pugio</i>	Daggerblade Grass Shrimp	-	2.5 ± 7.5 (47)	-	-	0.6 ± 1.2 (11)	2.5 ± 6.8 (40)
<i>Callinectes sapidus</i>	Blue Crab	0.3 ± 0.7 (5)	-	< 0.05 (1)	< 0.05 (1)	-	0.1 ± 0.3 (1)
Total Nekton		51.2 ± 84.8 (973)	43.0 ± 84.4 (817)	20.5 ± 26.8 (431)	7.1 ± 15.4 (149)	50.9 ± 69.4 (865)	8.4 ± 13.3 (135)

Appendix 2. Nekton species richness at ASIS in 2008 summarized by site

Table 1. Estimated nekton species richness (Est. Species Richness $\pm$ SD) summarized by site at ASIS in 2008.

Site	No. of Stations	Observed No. of Species	Est. Species Richness + SD
2	8	8	9.8 $\pm$ 1.1
3	19	10	12.8 $\pm$ 1.5
4	18	7	7.9 $\pm$ 0.9
5	17	8	10.8 $\pm$ 1.5
6	21	12	15.8 $\pm$ 1.8
8	21	8	9.9 $\pm$ 1.3
9	19	8	9.9 $\pm$ 1.3
10	21	10	12.9 $\pm$ 1.6
11	18	10	14.7 $\pm$ 2.7

Appendix 3. Coordinates for nekton station locations at ASIS in 2008

Table 1. Coordinates for nekton station locations sampled at ASIS site 2 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A2P1_216_2008	Pool/Panne	480097	4213253
A2P2_93_2008	Pool/Panne	480041	4213239
A2P4_114_2008	Pool/Panne	480151	4213281
A2P5_100_2008	Pool/Panne	480122	4213269
A2P6_54_2008	Pool/Panne	480129	4213305
A2E_572_2008	Shoreline	479946	4213298
A2E_678_2008	Shoreline	479974	4213215
A2E_718_2008	Shoreline	479995	4213202

Table 2. Coordinates for nekton station locations sampled at ASIS site 3 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A3P1_275_2008	Pool/Panne	484664	4225914
A3P10_125_2008	Pool/Panne	484638	4225924
A3P11_280_2008	Pool/Panne	484521	4225917
A3P12_206_2008	Pool/Panne	484755	4225808
A3P13_0_2008	Pool/Panne	484704	4225883
A3P2_271_2008	Pool/Panne	484712	4225876
A3P3_12_2008	Pool/Panne	484600	4225954
A3P4_154_2008	Pool/Panne	484714	4225885
A3P5_285_2008	Pool/Panne	484641	4225906
A3P6_160_2008	Pool/Panne	484689	4225894
A3P7_81_2008	Pool/Panne	484803	4225839
A3P8_74_2008	Pool/Panne	484628	4225942
A3P9_304_2008	Pool/Panne	484585	4225950
A3C_15_2008	Tidal Creek	484768	4225763
A3C_154_2008	Tidal Creek	484651	4225834
A3C_77_2008	Tidal Creek	484719	4225813
A3E_170_2008	Shoreline	484565	4225867
A3E_761_2008	Shoreline	484794	4225867
A3E_80_2008	Shoreline	484568	4225827

Table 3. Coordinates for nekton station locations sampled at ASIS site 4 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A4P1_309_2008	Pool/Panne	484146	4224497
A4P10_219_2008	Pool/Panne	484368	4224602
A4P11_309_2008	Pool/Panne	484310	4224439
A4P2_283_2008	Pool/Panne	484362	4224420
A4P3_219_2008	Pool/Panne	484171	4224452
A4P4_101_2008	Pool/Panne	484161	4224502
A4P5_192_2008	Pool/Panne	484009	4224482
A4P6_175_2008	Pool/Panne	484380	4224492
A4P7_28_2008	Pool/Panne	484385	4224413
A4P8_219_2008	Pool/Panne	484208	4224400
A4P9_273_2008	Pool/Panne	484218	4224421
A4C_10_2008	Tidal Creek	483987	4224492
A4C_27_2008	Tidal Creek	484396	4224461
A4C_28_2008	Tidal Creek	484392	4224469
A4C_3_2008	Tidal Creek	484114	4224392
A4C_34_2008	Tidal Creek	484387	4224469
A4E_1906_2008	Shoreline	484365	4224606
A4E_258_2008	Shoreline	484244	4224484

Table 4. Coordinates for nekton station locations sampled at ASIS site 5 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A5P1_105_2008	Pool/Panne	479011	4211319
A5P10_156_2008	Pool/Panne	479064	4211387
A5P11_206_2008	Pool/Panne	479055	4211430
A5P12_218_2008	Pool/Panne	479236	4211210
A5P13_24_2008	Pool/Panne	479045	4211281
A5P14_2_2008	Pool/Panne	479012	4211239
A5P2_318_2008	Pool/Panne	479000	4211260
A5P3_106_2008	Pool/Panne	479099	4211458
A5P4_334_2008	Pool/Panne	479097	4211390
A5P5_192_2008	Pool/Panne	479257	4211204
A5P6_284_2008	Pool/Panne	479001	4211210
A5P7_356_2008	Pool/Panne	479014	4211305
A5P8_260_2008	Pool/Panne	479006	4211282
A5P9_180_2008	Pool/Panne	479066	4211161
A5E_618_2008	Shoreline	478954	4211182
A5E_6540_2008	Shoreline	479172	4211340
A5E_7098_2008	Shoreline	478890	4211149

Table 5. Coordinates for nekton station locations sampled at ASIS site 6 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A6P1_128_2008	Pool/Panne	483450	4221418
A6P10_71_2008	Pool/Panne	483336	4221630
A6P11_100_2008	Pool/Panne	483471	4221417
A6P12_99_2008	Pool/Panne	483439	4221481
A6P13_81_2008	Pool/Panne	483422	4221725
A6P14_99_2008	Pool/Panne	483366	4221659
A6P15_214_2008	Pool/Panne	483477	4221432
A6P2_216_2008	Pool/Panne	483482	4221585
A6P3_170_2008	Pool/Panne	483477	4221553
A6P4_15_2008	Pool/Panne	483433	4221458
A6P5_284_2008	Pool/Panne	483453	4221660
A6P6_0_2008	Pool/Panne	483506	4221385
A6P7_192_2008	Pool/Panne	483404	4221646
A6P8_219_2008	Pool/Panne	483370	4221738
A6P9_182_2008	Pool/Panne	483575	4221356
A6C_10_2008	Tidal Creek	483419	4221476
A6C_54_2008	Tidal Creek	483484	4221386
A6C_56_2008	Tidal Creek	483481	4221384
A6E_1336_2008	Shoreline	483447	4221397
A6E_145_2008	Shoreline	483373	4221783
A6E_843_2008	Shoreline	483257	4221600

Table 6. Coordinates for nekton station locations sampled at ASIS site 8 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A8P1_218_2008	Pool/Panne	480639	4215726
A8P11_206_2008	Pool/Panne	480817	4215550
A8P12_73_2008	Pool/Panne	480795	4215456
A8P13_78_2008	Pool/Panne	480614	4215557
A8P14_275_2008	Pool/Panne	480736	4215497
A8P15_185_2008	Pool/Panne	480784	4215575
A8P16_325_2008	Pool/Panne	480646	4215645
A8P17_83_2008	Pool/Panne	480683	4215695
A8P2_321_2008	Pool/Panne	480667	4215673
A8P20_175_2008	Pool/Panne	480628	4215662
A8P21_214_2008	Pool/Panne	480558	4215691
A8P3_81_2008	Pool/Panne	480710	4215581
A8P4_28_2008	Pool/Panne	480776	4215458
A8P7_185_2008	Pool/Panne	480654	4215704
A8P9_219_2008	Pool/Panne	480658	4215655
A8C_117_2008	Tidal Creek	480580	4215735
A8C_216_2008	Tidal Creek	480628	4215551
A8C_68_2008	Tidal Creek	480616	4215765
A8E_137_2008	Shoreline	480526	4215616
A8E_735_2008	Shoreline	480698	4215418
A8E_837_2008	Shoreline	480502	4215848

Table 7. Coordinates for nekton station locations sampled at ASIS site 9 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A9P1_158_2008	Pool/Panne	484079	4223805
A9P11_32_2008	Pool/Panne	484065	4223804
A9P12_328_2008	Pool/Panne	484071	4223760
A9P13_275_2008	Pool/Panne	484131	4223797
A9P14_15_2008	Pool/Panne	483901	4223810
A9P15_223_2008	Pool/Panne	483899	4223719
A9P16_28_2008	Pool/Panne	484043	4223770
A9P2_183_2008	Pool/Panne	483953	4223642
A9P3_325_2008	Pool/Panne	483988	4223663
A9P4_284_2008	Pool/Panne	484078	4223724
A9P5_283_2008	Pool/Panne	483964	4223714
A9P8_325_2008	Pool/Panne	484042	4223684
A9P9_108_2008	Pool/Panne	483909	4223780
A9C_174_2008	Tidal Creek	484028	4223705
A9C_190_2008	Tidal Creek	484028	4223729
A9C_76_2008	Tidal Creek	483928	4223576
A9E_456_2008	Shoreline	483930	4223833
A9E_677_2008	Shoreline	483994	4223749
A9E_738_2008	Shoreline	484001	4223775

Table 8. Coordinates for nekton station locations sampled at ASIS site 10 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A10P1_44_2008	Pool/Panne	481273	4215996
A10P10_70_2008	Pool/Panne	481220	4215974
A10P11_71_2008	Pool/Panne	481239	4215889
A10P13_283_2008	Pool/Panne	481294	4215947
A10P15_291_2008	Pool/Panne	481172	4215988
A10P16_242_2008	Pool/Panne	481301	4216023
A10P19_353_2008	Pool/Panne	481147	4215935
A10P20_203_2008	Pool/Panne	481221	4215932
A10P21_252_2008	Pool/Panne	481241	4215999
A10P22_0_2008	Pool/Panne	481297	4215934
A10P3_175_2008	Pool/Panne	481216	4215947
A10P4_341_2008	Pool/Panne	481177	4215995
A10P6_93_2008	Pool/Panne	481303	4215911
A10P7_128_2008	Pool/Panne	481322	4215909
A10P8_330_2008	Pool/Panne	481215	4215988
A10C_15_2008	Tidal Creek	481177	4216015
A10C_37_2008	Tidal Creek	481135	4216022
A10C_68_2008	Tidal Creek	481112	4216006
A10E_125_2008	Shoreline	481166	4216030
A10E_205_2008	Shoreline	481090	4216001
A10E_62_2008	Shoreline	481221	4216033

Table 9. Coordinates for nekton station locations sampled at ASIS site 11 in 2008, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
A11P1_283_2008	Pool/Panne	483697	4222637
A11P10_284_2008	Pool/Panne	483652	4222463
A11P11_185_2008	Pool/Panne	483513	4222653
A11P12_28_2008	Pool/Panne	483693	4222629
A11P13_226_2008	Pool/Panne	483678	4222516
A11P14_50_2008	Pool/Panne	483594	4222598
A11P15_284_2008	Pool/Panne	483673	4222572
A11P2_133_2008	Pool/Panne	483671	4222535
A11P3_99_2008	Pool/Panne	483613	4222484
A11P4_202_2008	Pool/Panne	483624	4222366
A11P5_81_2008	Pool/Panne	483556	4222344
A11P6_303_2008	Pool/Panne	483694	4222571
A11P7_306_2008	Pool/Panne	483683	4222655
A11P8_101_2008	Pool/Panne	483581	4222660
A11P9_175_2008	Pool/Panne	483671	4222499
A11E_382_2008	Shoreline	483439	4222652
A11E_791_2008	Shoreline	483563	4222647
A11E_979_2008	Shoreline	483577	4222578

Appendix 4. Coordinates for vegetation plot locations at ASIS in 2008

Table 1. Coordinates for vegetation plot locations sampled at ASIS site 2 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A2V108_2008	480006	4213219	A2V2608_2008	480112	4213343
A2V208_2008	480067	4213279	A2V2708_2008	480118	4213347
A2V308_2008	480104	4213324	A2V2808_2008	480138	4213362
A2V408_2008	480105	4213326	A2V2908_2008	480145	4213366
A2V508_2008	480117	4213338	A2V3008_2008	480173	4213381
A2V608_2008	480151	4213368	A2V3108_2008	480201	4213399
A2V708_2008	480180	4213441	A2V3208_2008	480220	4213408
A2V808_2008	480211	4213460	A2V3308_2008	480014	4213200
A2V908_2008	479955	4213250	A2V3408_2008	480047	4213227
A2V1008_2008	479969	4213261	A2V3508_2008	480082	4213262
A2V1108_2008	480076	4213321	A2V3608_2008	480092	4213272
A2V1208_2008	480080	4213324	A2V3708_2008	480173	4213368
A2V1308_2008	480174	4213380	A2V3808_2008	480069	4213219
A2V1408_2008	480213	4213402	A2V3908_2008	480094	4213245
A2V1508_2008	480217	4213404	A2V4008_2008	480137	4213287
A2V1608_2008	480028	4213297	A2V4108_2008	480163	4213313
A2V1708_2008	480072	4213344	A2V4208_2008	480179	4213327
A2V1808_2008	480108	4213377	A2V4308_2008	480057	4213305
A2V1908_2008	480175	4213440	A2V4408_2008	480104	4213347
A2V2008_2008	480186	4213453	A2V4508_2008	480122	4213363
A2V2108_2008	480188	4213451	A2V4608_2008	480174	4213403
A2V2208_2008	480193	4213455	A2V4708_2008	480208	4213431
A2V2308_2008	479955	4213298	A2V4808_2008	480219	4213445
A2V2408_2008	480198	4213449	A2V4908_2008	480171	4213198
A2V2508_2008	480234	4213472	A2V5008_2008	480184	4213212

Table 2. Coordinates for vegetation plot locations sampled at ASIS site 3 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A3V1008_2008	484503	4225928	A3V2608_2008	484754	4225842
A3V208_2008	484498	4225908	A3V2708_2008	484756	4225815
A3V308_2008	484775	4225819	A3V2808_2008	484756	4225796
A3V408_2008	484776	4225813	A3V2908_2008	484755	4225787
A3V508_2008	484775	4225802	A3V3008_2008	484673	4226001
A3V608_2008	484775	4225799	A3V3108_2008	484673	4225989
A3V708_2008	484507	4225939	A3V3208_2008	484673	4225968
A3V808_2008	484508	4225921	A3V3308_2008	484674	4225959
A3V908_2008	484509	4225901	A3V3408_2008	484674	4225906
A3V108_2008	484777	4225893	A3V3508_2008	484674	4225883
A3V1108_2008	484503	4225922	A3V3608_2008	484674	4225849
A3V1208_2008	484513	4225953	A3V3708_2008	484721	4226009
A3V1308_2008	484513	4225913	A3V3808_2008	484721	4226005
A3V1408_2008	484515	4225890	A3V3908_2008	484722	4225980
A3V1508_2008	484625	4225903	A3V4008_2008	484721	4225963
A3V1608_2008	484623	4225881	A3V4108_2008	484722	4225911
A3V1708_2008	484624	4225878	A3V4208_2008	484722	4225870
A3V1808_2008	484624	4225863	A3V4308_2008	484721	4225834
A3V1908_2008	484625	4225841	A3V4408_2008	484721	4225809
A3V2008_2008	484625	4225820	A3V4508_2008	484772	4225862
A3V2108_2008	484626	4225817	A3V4608_2008	484771	4225858
A3V2208_2008	484756	4225960	A3V4708_2008	484770	4225831
A3V2308_2008	484756	4225908	A3V4808_2008	484771	4225804
A3V2408_2008	484756	4225901	A3V4908_2008	484770	4225789
A3V2508_2008	484757	4225887	A3V5008_2008	484770	4225784

Table 3. Coordinates for vegetation plot locations sampled at ASIS site 4 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A4V1008_2008	484222	4224506	A4V2608_2008	484276	4224596
A4V208_2008	484264	4224505	A4V2708_2008	484342	4224594
A4V308_2008	484272	4224505	A4V2808_2008	484371	4224596
A4V408_2008	484329	4224501	A4V2908_2008	484108	4224514
A4V508_2008	484376	4224505	A4V3008_2008	484142	4224512
A4V608_2008	484113	4224509	A4V3108_2008	484190	4224509
A4V708_2008	484152	4224509	A4V3208_2008	484221	4224509
A4V808_2008	484160	4224510	A4V3308_2008	484344	4224504
A4V908_2008	484222	4224508	A4V3408_2008	484282	4224586
A4V108_2008	484209	4224505	A4V3508_2008	484288	4224584
A4V1108_2008	484185	4224565	A4V3608_2008	484306	4224585
A4V1208_2008	484205	4224563	A4V3708_2008	484360	4224584
A4V1308_2008	484243	4224568	A4V3808_2008	484110	4224484
A4V1408_2008	484245	4224562	A4V3908_2008	484124	4224484
A4V1508_2008	484351	4224558	A4V4008_2008	484135	4224481
A4V1608_2008	484067	4224443	A4V4108_2008	484217	4224478
A4V1708_2008	484077	4224441	A4V4208_2008	484257	4224478
A4V1808_2008	484164	4224438	A4V4308_2008	484290	4224477
A4V1908_2008	484213	4224435	A4V4408_2008	484344	4224474
A4V2008_2008	484339	4224434	A4V4508_2008	484126	4224449
A4V2108_2008	484134	4224517	A4V4608_2008	484171	4224449
A4V2208_2008	484200	4224512	A4V4708_2008	484231	4224444
A4V2308_2008	484227	4224512	A4V4808_2008	484319	4224442
A4V2408_2008	484239	4224512	A4V4908_2008	484329	4224441
A4V2508_2008	484180	4224604	A4V5008_2008	484357	4224440

Table 4. Coordinates for vegetation plot locations sampled at ASIS site 5 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A5V108_2008	479114	4211149	A5V2708_2008	479139	4211294
A5V208_2008	479152	4211182	A5V2808_2008	479139	4211296
A5V308_2008	479186	4211207	A5V2908_2008	479074	4211105
A5V408_2008	479191	4211212	A5V3008_2008	479092	4211124
A5V508_2008	479212	4211228	A5V3108_2008	479108	4211134
A5V608_2008	479031	4211198	A5V3208_2008	479258	4211257
A5V708_2008	479073	4211231	A5V3308_2008	479096	4211125
A5V808_2008	479101	4211253	A5V3408_2008	479114	4211137
A5V908_2008	479155	4211298	A5V3508_2008	479117	4211136
A5V1008_2008	479228	4211355	A5V3608_2008	479160	4211173
A5V1108_2008	479232	4211358	A5V3708_2008	479191	4211195
A5V1208_2008	479016	4211243	A5V3808_2008	479056	4211175
A5V1308_2008	479031	4211253	A5V3908_2008	479077	4211189
A5V1408_2008	479078	4211292	A5V4008_2008	479097	4211210
A5V1508_2008	479138	4211341	A5V4108_2008	479106	4211214
A5V1608_2008	479146	4211344	A5V4208_2008	479195	4211286
A5V1708_2008	478944	4211234	A5V4308_2008	479224	4211311
A5V1808_2008	479000	4211277	A5V4408_2008	479072	4211301
A5V1908_2008	479145	4211393	A5V4508_2008	479117	4211334
A5V2008_2008	479148	4211396	A5V4608_2008	479135	4211349
A5V2108_2008	478930	4211126	A5V4708_2008	479142	4211356
A5V2208_2008	479031	4211209	A5V4808_2008	478961	4211180
A5V2308_2008	479024	4211233	A5V4908_2008	478998	4211208
A5V2408_2008	479049	4211222	A5V5008_2008	479072	4211271
A5V2508_2008	479106	4211258	A5V5108_2008	479096	4211289
A5V2608_2008	479133	4211289			

Table 5. Coordinates for vegetation plot locations sampled at ASIS site 6 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A6V108_2008	483441	4221761	A6V2608_2008	483431	4221423
A6V208_2008	483429	4221764	A6V2708_2008	483420	4221423
A6V308_2008	483411	4221763	A6V2808_2008	483416	4221423
A6V408_2008	483393	4221762	A6V2908_2008	483410	4221423
A6V508_2008	483381	4221763	A6V3008_2008	483482	4221548
A6V608_2008	483364	4221763	A6V3108_2008	483443	4221546
A6V708_2008	483454	4221524	A6V3208_2008	483439	4221547
A6V808_2008	483441	4221523	A6V3308_2008	483488	4221463
A6V908_2008	483426	4221523	A6V3408_2008	483462	4221464
A6V1008_2008	483522	4221372	A6V3508_2008	483423	4221465
A6V1108_2008	483516	4221373	A6V3608_2008	483412	4221464
A6V1208_2008	483425	4221733	A6V3708_2008	483398	4221462
A6V1308_2008	483397	4221735	A6V3808_2008	483387	4221463
A6V1408_2008	483358	4221734	A6V3908_2008	483368	4221465
A6V1508_2008	483346	4221734	A6V4008_2008	483510	4221438
A6V1608_2008	483317	4221736	A6V4108_2008	483482	4221437
A6V1708_2008	483317	4221734	A6V4208_2008	483477	4221437
A6V1808_2008	483286	4221736	A6V4308_2008	483469	4221439
A6V1908_2008	483270	4221735	A6V4408_2008	483372	4221439
A6V2008_2008	483255	4221734	A6V4508_2008	483371	4221438
A6V2108_2008	483561	4221350	A6V4608_2008	483361	4221437
A6V2208_2008	483549	4221353	A6V4708_2008	483487	4221473
A6V2308_2008	483543	4221352	A6V4808_2008	483477	4221475
A6V2408_2008	483508	4221422	A6V4908_2008	483471	4221474
A6V2508_2008	483478	4221424	A6V5008_2008	483420	4221473

Table 6. Coordinates for vegetation plot locations sampled at ASIS site 8 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A8V108_2008	480688	4215686	A8V2708_2008	480507	4215640
A8V208_2008	480695	4215682	A8V2808_2008	480516	4215627
A8V308_2008	480720	4215648	A8V2908_2008	480594	4215523
A8V408_2008	480734	4215628	A8V3008_2008	480604	4215512
A8V508_2008	480767	4215588	A8V3108_2008	480604	4215512
A8V608_2008	480811	4215527	A8V3208_2008	480596	4215685
A8V708_2008	480555	4215728	A8V3308_2008	480609	4215671
A8V808_2008	480605	4215666	A8V3408_2008	480620	4215655
A8V908_2008	480740	4215487	A8V3508_2008	480619	4215656
A8V1008_2008	480752	4215474	A8V3608_2008	480751	4215483
A8V1108_2008	480771	4215451	A8V3708_2008	480782	4215462
A8V1208_2008	480573	4215688	A8V3808_2008	480500	4215753
A8V1308_2008	480583	4215674	A8V3908_2008	480558	4215679
A8V1408_2008	480591	4215664	A8V4008_2008	480576	4215656
A8V1508_2008	480608	4215642	A8V4108_2008	480605	4215617
A8V1608_2008	480724	4215492	A8V4208_2008	480624	4215593
A8V1708_2008	480523	4215631	A8V4308_2008	480464	4215681
A8V1808_2008	480599	4215533	A8V4408_2008	480470	4215673
A8V1908_2008	480620	4215515	A8V4508_2008	480571	4215549
A8V2008_2008	480659	4215454	A8V4608_2008	480645	4215447
A8V2108_2008	480643	4215695	A8V4708_2008	480562	4215682
A8V2208_2008	480668	4215659	A8V4808_2008	480578	4215643
A8V2308_2008	480669	4215657	A8V4908_2008	480599	4215633
A8V2408_2008	480694	4215630	A8V5008_2008	480651	4215566
A8V2508_2008	480753	4215549	A8V5108_2008	480721	4215474
A8V2608_2008	480821	4215486			

Table 7. Coordinates for vegetation plot locations sampled at ASIS site 9 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A9V108_2008	483924	4223585	A9V2608_2008	484150	4223702
A9V208_2008	483931	4223585	A9V2708_2008	483873	4223854
A9V308_2008	484056	4223627	A9V2808_2008	483898	4223854
A9V408_2008	484057	4223627	A9V2908_2008	483888	4223851
A9V508_2008	484065	4223627	A9V3008_2008	483921	4223850
A9V608_2008	484105	4223627	A9V3108_2008	483848	4223518
A9V708_2008	484108	4223628	A9V3208_2008	483890	4223518
A9V808_2008	484124	4223627	A9V3308_2008	483902	4223519
A9V908_2008	484130	4223627	A9V3408_2008	483856	4223528
A9V1008_2008	483864	4223726	A9V3508_2008	483921	4223528
A9V1108_2008	483882	4223727	A9V3608_2008	483854	4223761
A9V1208_2008	483885	4223727	A9V3708_2008	483874	4223767
A9V1308_2008	483895	4223726	A9V3808_2008	483967	4223757
A9V1408_2008	483968	4223726	A9V3908_2008	484014	4223761
A9V1508_2008	484063	4223725	A9V4008_2008	484047	4223761
A9V1608_2008	484064	4223725	A9V4108_2008	484052	4223762
A9V1708_2008	484151	4223726	A9V4208_2008	484106	4223762
A9V1808_2008	484164	4223725	A9V4308_2008	484132	4223762
A9V1908_2008	483893	4223700	A9V4408_2008	484157	4223761
A9V2008_2008	483937	4223701	A9V4508_2008	484189	4223761
A9V2108_2008	483938	4223701	A9V4608_2008	483781	4223819
A9V2208_2008	483945	4223702	A9V4708_2008	483805	4223820
A9V2308_2008	484031	4223702	A9V4808_2008	483843	4223820
A9V2408_2008	484035	4223700	A9V4908_2008	483846	4223821
A9V2508_2008	484064	4223701	A9V5008_2008	483929	4223820

Table 8. Coordinates for vegetation plot locations sampled at ASIS site 10 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A10V108_2008	481268	4216016	A10V2608_2008	481215	4216032
A10V208_2008	481297	4215999	A10V2708_2008	481221	4216017
A10V308_2008	481302	4215993	A10V2808_2008	481260	4215964
A10V408_2008	481212	4216036	A10V2908_2008	481288	4215926
A10V508_2008	481216	4216036	A10V3008_2008	481300	4215911
A10V608_2008	481304	4215911	A10V3108_2008	481109	4216009
A10V708_2008	481330	4215873	A10V3208_2008	481131	4215977
A10V808_2008	481329	4215872	A10V3308_2008	481208	4215873
A10V908_2008	481297	4215969	A10V3408_2008	481210	4215868
A10V1008_2008	481300	4215967	A10V3508_2008	481215	4215859
A10V1108_2008	481312	4215945	A10V3608_2008	481236	4215829
A10V1208_2008	481319	4215936	A10V3708_2008	481245	4216025
A10V1308_2008	481371	4215869	A10V3808_2008	481254	4216010
A10V1408_2008	481221	4215943	A10V3908_2008	481276	4215980
A10V1508_2008	481228	4215934	A10V4008_2008	481285	4215968
A10V1608_2008	481275	4215873	A10V4108_2008	481294	4215955
A10V1708_2008	481300	4215832	A10V4208_2008	481093	4216001
A10V1808_2008	481311	4215818	A10V4308_2008	481099	4215994
A10V1908_2008	481325	4215797	A10V4408_2008	481143	4215929
A10V2008_2008	481207	4215926	A10V4508_2008	481149	4215921
A10V2108_2008	481221	4215909	A10V4608_2008	481174	4215887
A10V2208_2008	481231	4215892	A10V4708_2008	481311	4216009
A10V2308_2008	481238	4215886	A10V4808_2008	481330	4215983
A10V2408_2008	481270	4215840	A10V4908_2008	481332	4215982
A10V2508_2008	481281	4215822	A10V5008_2008	481347	4215960

Table 9. Coordinates for vegetation plot locations sampled at ASIS site 11 in 2008, UTM, Zone 18, NAD 83, meters.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
A11V108_2008	483420	4222623	A11V2608_2008	483674	4222440
A11V208_2008	483421	4222623	A11V2708_2008	483472	4222660
A11V308_2008	483447	4222616	A11V2808_2008	483519	4222647
A11V408_2008	483462	4222610	A11V2908_2008	483575	4222631
A11V508_2008	483491	4222602	A11V3008_2008	483579	4222629
A11V608_2008	483584	4222573	A11V3108_2008	483601	4222623
A11V708_2008	483520	4222394	A11V3208_2008	483608	4222620
A11V808_2008	483565	4222382	A11V3308_2008	483550	4222511
A11V908_2008	483587	4222375	A11V3408_2008	483576	4222504
A11V1008_2008	483449	4222600	A11V3508_2008	483682	4222472
A11V1108_2008	483469	4222600	A11V3608_2008	483567	4222401
A11V1208_2008	483481	4222597	A11V3708_2008	483643	4222378
A11V1308_2008	483524	4222583	A11V3808_2008	483648	4222377
A11V1408_2008	483591	4222563	A11V3908_2008	483499	4222626
A11V1508_2008	483611	4222559	A11V4008_2008	483504	4222624
A11V1608_2008	483578	4222676	A11V4108_2008	483514	4222622
A11V1708_2008	483655	4222652	A11V4208_2008	483578	4222603
A11V1808_2008	483677	4222647	A11V4308_2008	483607	4222595
A11V1908_2008	483682	4222644	A11V4408_2008	483612	4222592
A11V2008_2008	483721	4222635	A11V4508_2008	483488	4222642
A11V2108_2008	483438	4222509	A11V4608_2008	483505	4222641
A11V2208_2008	483528	4222481	A11V4708_2008	483511	4222639
A11V2308_2008	483530	4222482	A11V4808_2008	483660	4222592
A11V2408_2008	483534	4222481	A11V4908_2008	483662	4222595
A11V2508_2008	483627	4222454	A11V5008_2008	483673	4222592

