



Monitoring Salt Marsh Vegetation and Nekton at William Floyd Estate, Fire Island National Seashore

2011 Summary Report

Natural Resource Data Series NPS/NCBN/NRDS—2012/399



ON THE COVER

Salt marsh at William Floyd Estate, Fire Island National Seashore.
Photograph courtesy of Fire Island National Seashore

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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are 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.

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Contents

	Page
Figures.....	v
Tables.....	v
Abstract.....	vii
Acknowledgments.....	ix
Introduction.....	1
Methods.....	3
Permanent Site Selection	3
Nekton Sampling Station Selection and Data Collection	4
Vegetation Plot Selection and Data Collection	4
Data Summary	6
Nekton.....	6
Vegetation	6
Results.....	8
Nekton.....	8
Vegetation.....	8
Literature Cited	15
Appendix A: Coordinates for nekton stations at WIFL in 2011	17
Appendix B: Coordinates for vegetation plots at WIFL in 2011	19
Appendix C: Nekton density summarized by site.....	23
Appendix D. Nekton species richness summarized by site and sampling event	25
Appendix E. Nekton species and community composition summarized by site and sampling event	27
Appendix F. Vegetation frequency summarized by site	29
Appendix G. Vegetation relative percent cover summarized by site.....	31

Figures

	Page
Figure 1. Locations of the three permanent nekton and vegetation monitoring sites established by NCBN at the William Floyd Estate, Fire Island National Seashore in 2009.....	3

Tables

	Page
Table 1. Sampling dates and number of nekton stations at three marsh sites at WIFL in 2011.	4
Table 2. Sampling dates and number of vegetation plots at three marsh sites at WIFL in 2011.	5
Table 3. Definition of standard cover type categories used in the Northeast Coastal and Barrier Network salt marsh vegetation monitoring protocol	5
Table 4. Modified Braun-Blanquet scale and corresponding midpoint values for determining percent cover of salt marsh vegetation.	6
Table 5. (a) Average density and standard error [individuals per 1 m ² ± SE (total count)] of nekton captured at WIFL in 2011.	8
Table 6. Nekton species richness (No. of Species) at WIFL in 2011.	9
Table 7. Nekton species and community composition (% catch) at WIFL in 2011.	9
Table 8. (a) Average length [mm ± SE (no. measured)] of nekton at WIFL in 2011.	10
Table 9. Average water temperature, depth, and salinity [Average ± SE (no. of stations)] at nekton sampling stations at WIFL in 2011.	11
Table 10. Average percent cover (Average % Cover ± SE), frequency, and relative percent prevalence of each plant species and non-vegetation cover type observed at WIFL in 2011.....	12

Abstract

The Northeast Coastal and Barrier Network (NCBN) began monitoring salt marsh vegetation and nekton at the William Floyd Estate (WIFL) in 2009. This report summarizes the second year of data collected at three sites during the summer of 2011. Monitoring will continue on a biennial basis.

A total of 150 vegetation plots were sampled at WIFL in July 2011. 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. Eighteen vegetation species and four non-vegetation cover types (bare ground, wrack & litter, trash, and water) were observed.

A total of thirty six nekton stations were established (on ditches and pools/pannes) in 2011. Each station was sampled twice during the summer—once in late June / early July, and again in August. Sampling stations located on pools/pannes were sampled using a 1 m² aluminum throw trap. Stations located along tidal ditches were sampled with ditch nets. Six species of nekton (four fish, one crab, and one shrimp species) were identified. Examination of percent catch data indicates that *F. heteroclitus* (22%) and *P. pugio* (74.8%) accounted for approximately 97% of all nekton captured at WIFL in 2011.

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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 report summarizes salt marsh vegetation and nekton community data collected at the William Floyd Estate (WIFL) in 2011, 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).

The William Floyd Estate is the former home of General William Floyd, a signer of the Declaration of Independence, and was donated by the Nichols family to the NPS in 1965. WIFL is located on the southern shore of Long Island in Mastic Beach, Suffolk County, New York and is managed by the NPS as a detached unit of Fire Island National Seashore (FIIS).

Methods

Permanent Site Selection

Three permanent 5-8 hectare salt marsh sites were selected for monitoring at WIFL (Fig. 1). The number of sites chosen within the park was based on available habitat and the logistics and feasibility of sampling. 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 (James-Pirri et al. In Review) and Nekton Protocols (James-Pirri et al. 2012).

Vegetation and nekton sampling at WIFL began in 2009, and will continue on a biennial basis.



Figure 1. Three permanent nekton and vegetation monitoring sites were established by NCBN at the William Floyd Estate, Fire Island National Seashore in 2009. These three sites will be monitored biennially.

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. Ten ditch net stations were established at each of the three monitoring sites. If pools were present, all fishable pools within each site were sampled. Nekton stations were randomly located along the length of each ditch or along the perimeter of a pool. Although we indicate if a ditch is obstructed, sampling of ditch habitat was not stratified by whether or not ditches were obstructed because, in many cases, obstructions may be transient and differences between these two types of ditches is not a focus of the nekton monitoring program. Nekton stations were sampled twice, once in early summer and again in late summer (Table 1). A list of all nekton stations and their respective Universal Transverse Mercator (UTM) coordinates is provided in Appendix A.

Nekton in ditches were sampled using a ditch net, an enclosure gear designed to sample tidal ditches and smaller tidal creeks up to 1 m wide and 1 m deep (James-Pirri et al. 2010). All nekton were collected from the net and density was calculated by measuring the area of water the net sampled. Nekton in pools or 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 with a 1 mm mesh dip net.

For each net or trap, all fish and decapods were identified and enumerated. Fifteen haphazardly selected individuals of each species were 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.

Table 1. Sampling dates and number of nekton stations at three marsh sites at WIFL in 2011. Sampling stations are displayed by habitat type. ‘-’ habitat not present.

Site	Event	Dates	Habitat			Total
			Ditch		Pool/Panne	
			Unobstructed	Obstructed		
1	1	6/29/2011, 7/1/2011	4	6	3	13
1	2	8/9/2011	4	6	3	13
2	1	6/30/2011	9	1	-	10
2	2	8/10/2011	9	1	-	10
3	1	6/30/2011, 7/1/2011	7	3	3	13
3	2	8/11/2011	7	3	3	13

Vegetation Plot Selection and Data Collection

Vegetation sampling was conducted once at each of the three marsh sites (Table 2). Ten transects extending from bay to upland were systematically placed based on a single random start. Plots were located by treating the total length of all transects as a single transect and randomly selecting 50 points 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).

Table 2. Sampling dates and number of vegetation plots at three marsh sites at WIFL in 2011.

Site	Dates	No. of Plots
1	7/19/2011	51
2	7/21/2011	49
3	7/27/2011	50

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 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

Species composition, average density, average length of nekton, and standard error were all 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).

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 refer to it 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, we have chosen to average these values so that relative prevalence is on a more readily interpretable percent scale. We present the relative percent prevalence for each species and non-vegetation cover type as the average of the relative percent cover and the relative percent frequency. A detailed description of the analyses and formulae are presented in the salt marsh vegetation protocol (James-Pirri et al. In Review).

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

In addition to relative percent prevalence, we report the average percent cover of each species and non-vegetation cover type for all plots combined. 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.

If any identified vegetation species are listed by the United States Department of Agriculture (USDA) or the state of New York as exotic, invasive, threatened, endangered, or rare, these species are noted in the vegetation data summary. Information about plants listed by each state is available online (USDA 2012). Additional information about species listed by the state of New York as exotic or invasive is available online (Invasive Plant Council of New York 2007). Plants listed by the state of New York as threatened, endangered, or rare can be obtained from the rare plant list edited by Young (2008) for the New York Natural Heritage Program.

Lastly, if any species from one of the above categories is observed, these plots are noted in Appendix B, which includes a table of all vegetation plots and their respective Universal Transverse Mercator (UTM) coordinates.

Results

Nekton

The average nekton density for each sampling event at WIFL is presented in Tables 5a and b. Six nekton species were identified in 2011 (Table 6). Two individuals (1 crab and 1 juvenile fish) could not be identified. Common mummichog (*F. heteroclitus*) and daggerblade grass shrimp (*P. pugio*) account for approximately 97% of all nekton captured in 2011 (Table 7). The average, maximum, and minimum lengths for each species observed in 2011 are presented in Table 8. Additional tables summarizing data by site are provided in the Appendices.

Environmental variables at each nekton sampling station were recorded during each sampling event. These measures provide limited insight into differences between habitats that may affect nekton (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.

Vegetation

Eighteen vegetation species and four non-vegetation cover types were recorded at WIFL in 2011 (Table 10). Species are grouped by salinity tolerances (USDA 2012). 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.

One of the vegetation species observed in 2011, *Limonium carolinianum*, is listed by the State of New York as exploitably vulnerable (USDA 2012, Young 2008). *Phragmites australis* is listed by the state of New York as invasive (Invasive Plant Council of New York 2007).

Table 5. (a) Average density and standard error [individuals per 1 m² ± SE (total count)] of nekton captured at WIFL in 2011. Data are summarized for each sampling event and both events combined. (b) Number of nekton stations sampled at WIFL in 2011.

(a)

Habitat	Average Density [individuals per 1 m ² ± SE (total count)]		
	Event 1	Event 2	Events 1 & 2
Unobstructed Ditch	22.5 ± 6.0 (339)	158.7 ± 47.1 (2058)	90.6 ± 22.8 (2397)
Obstructed Ditch	9.3 ± 2.8 (91)	24.3 ± 10.1 (148)	16.8 ± 6.1 (239)
Pool / Panne	2.0 ± 1.0 (12)	2.7 ± 1.5 (16)	2.3 ± 1.2 (28)
All	15.4 ± 3.6 (442)	95.4 ± 28.6 (2222)	55.4 ± 14.3 (2664)

(b)

Habitat	No. of Stations		
	Event 1	Event 2	Events 1 & 2
Unobstructed Ditch	20	20	20
Obstructed Ditch	10	10	10
Pool / Panne	6	6	6
All	36	36	36

Table 6. Nekton species richness (No. of Species) at WIFL in 2011. Data are summarized for each sampling event and both events combined. '*' two species were not identified (1 crab escaped before identification, 1 juvenile fish was too small for identification).

Event	No. of Stations	No. of Species
1	36	6
2	36	7
1 & 2	36	8*

Table 7. Nekton species and community composition (% catch) at WIFL in 2011. Data are summarized for each sampling event and both events combined. n = total number of nekton captured. '-' species or community was not present. '*' two species were not identified (1 crab escaped before identification, 1 juvenile fish was too small for identification).

Life History Group/Species	Common Name	Group/Species Composition (%)		
		Event 1 (n = 442)	Event 2 (n = 2222)	Events 1 & 2 (n = 2664)
Resident Fish		79.4	13.3	24.3
<i>Fundulus heteroclitus</i>	common mummichog	76.7	11.2	22.0
<i>Lucania parva</i>	rainwater killifish	-	1.7	1.4
<i>Cyprinodon variegatus</i>	sheepshead minnow	2.7	0.5	0.8
Resident Shrimp		17.9	86.1	74.8
<i>Palaemonetes pugio</i>	daggerblade grass shrimp	17.9	86.1	74.8
Transient Crustacean		1.6	0.2	0.4
<i>Callinectes sapidus</i>	blue crab	1.6	0.2	0.4
Transient Fish		0.9	0.3	0.4
<i>Menidia menidia</i>	Atlantic silverside	0.9	0.3	0.4
Unknown*		0.2	< 0.05	0.1
Unknown Crab	unknown crab	-	< 0.05	< 0.05
Unknown Juvenile	unknown juvenile fish	0.2	-	< 0.05

Table 8. (a) Average length [mm $\pm$ SE (no. measured)] of nekton at WIFL in 2011. Length data for each species is summarized over all stations sampled during each event and both events combined. '-' species or community was not present. '*' two species were not identified (1 crab escaped before identification, 1 juvenile fish was too small for identification). (b) Minimum and maximum length (mm) of each nekton species at WIFL in 2011. '-' species or community was not present. '*' two species were not identified (1 crab escaped before identification, 1 juvenile fish was too small for identification).

(a)

Life History Group/Species	Common Name	Average Length [mm ± SE (no. measured)]		
		Event 1	Event 2	Events 1 & 2
Resident Fish				
<i>Cyprinodon variegatus</i>	sheepshead minnow	15.4 ± 2.2 (12)	26.7 ± 2.9 (9)	20.2 ± 2.1 (21)
<i>Fundulus heteroclitus</i>	common mummichog	24.0 ± 0.6 (182)	39.6 ± 1.1 (171)	31.6 ± 0.7 (353)
<i>Lucania parva</i>	rainwater killifish	-	25.4 ± 1.6 (9)	25.4 ± 1.6 (9)
Resident Shrimp				
<i>Palaemonetes pugio</i>	daggerblade grass shrimp	18.0 ± 1.0 (62)	25.2 ± 0.3 (210)	23.5 ± 0.4 (272)
Transient Crustacean				
<i>Callinectes sapidus</i>	blue crab	57.3 ± 8.3 (7)	60.8 ± 23.6 (4)	58.5 ± 9.3 (11)
Transient Fish				
<i>Menidia menidia</i>	Atlantic silverside	21.0 ± 3.1 (4)	29.3 ± 2.8 (7)	26.3 ± 2.4 (11)
Unknown				
Unknown Crab	unknown crab	-	17.0 (1)	17.0 (1)
Unknown Juvenile	unknown juvenile fish	19.0 (1)	-	19.0 (1)

(b)

Life History Group/Species	Common Name	Event 1		Event 2		Events 1 & 2	
		Min.	Max.	Min.	Max.	Min.	Max.
Resident Fish							
<i>Cyprinodon variegatus</i>	sheepshead minnow	7	33	8	36	7	36
<i>Fundulus heteroclitus</i>	common mummichog	9	68	8	87	8	87
<i>Lucania parva</i>	rainwater killifish	-	-	20	36	20	36
Resident Shrimp							
<i>Palaemonetes pugio</i>	daggerblade grass shrimp	8	35	15	40	8	40
Transient Crustacean							
<i>Callinectes sapidus</i>	blue crab	28	92	9	114	9	114
Transient Fish							
<i>Menidia menidia</i>	Atlantic silverside	13	28	17	36	13	36
Unknown							
Unknown Crab	unknown crab	-	-	17	17	17	17
Unknown Juvenile	unknown juvenile fish	19	19	-	-	19	19

Table 9. Average water temperature, depth, and salinity [Average $\pm$ SE (no. of stations)] at nekton sampling stations at WIFL in 2011. Data are summarized over all stations for each sampling event.

Habitat	Average $\pm$ SE (no. of stations)					
	Event 1			Event 2		
	Ditch		Pool/Panne	Ditch		Pool/Panne
	Unobstructed	Obstructed		Unobstructed	Obstructed	
Temp ($^{\circ}$ C)	24.0 $\pm$ 0.3 (20)	27.7 $\pm$ 0.7 (10)	31.4 $\pm$ 1.4 (6)	26.2 $\pm$ 0.3 (20)	25.9 $\pm$ 0.4 (10)	31.5 $\pm$ 0.9 (6)
Depth (cm)	32.2 $\pm$ 2.8 (20)	32.7 $\pm$ 5.4 (10)	11.3 $\pm$ 0.9 (6)	40.0 $\pm$ 2.8 (20)	42.2 $\pm$ 4.8 (10)	12.6 $\pm$ 0.7 (6)
Salinity (ppt)	27.9 $\pm$ 0.6 (20)	28.6 $\pm$ 0.8 (10)	29.5 $\pm$ 0.3 (6)	26.6 $\pm$ 0.7 (20)	27.8 $\pm$ 0.6 (10)	26.3 $\pm$ 0.8 (6)

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 WIFL in 2011. Data were summarized over all 150 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). (NL) indicates standing non-living vegetation. ‘+’ species is listed as exploitably vulnerable in New York State (USDA 2012, Young 2008). ‘*’ species is listed as invasive or exotic in New York State (Invasive Plant Council of New York 2007). ‘^{ch}’ *Salicornia virginica*, an invalid synonym was used on the field data sheet; the accepted synonym *S. depressa* was retrieved from the ITIS database on 17 Sept 2012 (www.itis.gov).

Cover Type		Avg. %		Rel. %	Rel. %	Rel. %
Salinity Tolerance		Cover $\pm$ SE	Freq.	Cover	Freq.	Prevalence
Species	Common Name					
Vegetation		93.9 $\pm$ 4.3	134	65.5	71.6	68.5
High Salinity Tolerance		88.7 $\pm$ 4.5	133	62.0	64.1	63.0
<i>Spartina alterniflora</i>	saltmarsh cordgrass	35.9 $\pm$ 2.3	116	25.1	16.7	20.9
<i>Spartina alterniflora</i> (NL)	saltmarsh cordgrass (NL)	15.9 $\pm$ 1.9	99	11.1	14.3	12.7
<i>Spartina patens</i>	salt meadow cordgrass	12.0 $\pm$ 1.9	49	8.4	7.1	7.8
<i>Spartina patens</i> (NL)	salt meadow cordgrass (NL)	13.3 $\pm$ 2.3	40	9.3	5.8	7.6
<i>Distichlis spicata</i>	spikegrass	3.8 $\pm$ 0.9	41	2.6	5.9	4.2
<i>Distichlis spicata</i> (NL)	spikegrass (NL)	3.9 $\pm$ 1.1	36	2.7	5.2	4.0
<i>Salicornia maritima</i>	glasswort	0.6 $\pm$ 0.1	29	0.4	4.2	2.3
<i>Iva frutescens</i>	marsh elder	2.5 $\pm$ 0.9	13	1.7	1.9	1.8
<i>Iva frutescens</i> (NL)	marsh elder (NL)	0.1 $\pm$ 0.1	2	0.1	0.3	0.2
<i>Juncus gerardii</i>	black grass	0.4 $\pm$ 0.3	5	0.3	0.7	0.5
<i>Juncus gerardii</i> (NL)	black grass (NL)	< 0.05	1	< 0.05	0.1	< 0.05
<i>Salicornia depressa</i> [#]	Virginia glasswort	< 0.05	6	< 0.05	0.9	0.4
<i>Limonium carolinianum</i> +	sea lavender	< 0.05	2	< 0.05	0.3	0.2
<i>Limonium carolinianum</i> (NL)+	sea lavender (NL)	< 0.05	2	< 0.05	0.3	0.2
<i>Solidago sempervirens</i>	seaside goldenrod	0.1 $\pm$ 0.1	2	0.1	0.3	0.2
<i>Ruppia maritima</i>	widgeon grass	< 0.05	1	< 0.05	0.1	< 0.05
Medium Salinity Tolerance		0.9 $\pm$ 0.7	3	0.6	0.6	0.6
<i>Baccharis halimifolia</i>	Eastern baccharis	0.6 $\pm$ 0.6	2	0.4	0.3	0.4
<i>Toxicodendron radicans</i>	poison ivy	0.3 $\pm$ 0.3	1	0.2	0.1	0.2
<i>Morella pensylvanica</i>	Northern bayberry	< 0.05	1	< 0.05	0.1	< 0.05
<i>Schoenoplectus pungens</i> var. <i>pungens</i>	common threesquare	< 0.05	1	< 0.05	0.1	< 0.05
Low Salinity Tolerance		3.5 $\pm$ 1.1	25	2.4	6.5	4.5
<i>Phragmites australis</i> *	common reed	3.0 $\pm$ 0.9	24	2.1	3.5	2.8
<i>Phragmites australis</i> (NL)*	common reed (NL)	0.5 $\pm$ 0.2	21	0.4	3.0	1.7

Table 10 (continued). Average percent cover (Average % Cover $\pm$ SE), frequency, and relative percent prevalence of each plant species and non-vegetation cover type observed at WIFL in 2011. Data were summarized over all 150 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). (NL) indicates standing non-living vegetation. '+' species is listed as exploitably vulnerable in New York State (USDA 2012, Young 2008). '*' species is listed as invasive or exotic in New York State (Invasive Plant Council of New York 2007). [#] *Salicornia virginica*, an invalid synonym was used on the field data sheet; the accepted synonym *S. depressa* was retrieved from the ITIS database on 17 Sept 2012 (www.itis.gov).

Cover Type						
Salinity Tolerance						
Species	Common Name	Avg. % Cover $\pm$ SE	Freq.	Rel. % Cover	Rel. % Freq.	Rel. % Prevalence
No Salinity Tolerance		0.7 $\pm$ 0.7	1	0.5	0.3	0.4
<i>Quercus velutina</i>	black oak	0.6 $\pm$ 0.6	1	0.4	0.1	0.2
<i>Smilax rotundifolia</i>	common greenbrier	0.1 $\pm$ 0.1	1	0.1	0.1	0.1
<i>Elymus virginicus</i>	Virginia rye grass	< 0.05	1	< 0.05	0.1	< 0.05
Unknown Salinity Tolerance		< 0.05	1	< 0.05	0.1	< 0.05
Unknown plant	unknown plant	< 0.05	1	< 0.05	0.1	< 0.05
Non-Vegetation		39.5 $\pm$ 2.9	116	27.6	19.3	23.4
water	water	30.2 $\pm$ 3.1	74	21.1	10.7	15.9
bare ground	bare ground	9.3 $\pm$ 1.5	60	6.5	8.6	7.5
Incidental Cover		9.8 $\pm$ 1.6	62	6.9	8.9	7.9
Wrack & litter	wrack & liter	9.6 $\pm$ 1.6	61	6.7	8.8	7.8
trash	garbage / trash	0.3 $\pm$ 0.3	1	0.2	0.1	0.2

Literature Cited

- Integrated Taxonomic Information System (ITIS), on-line database. Available at <http://www.itis.gov/> (accessed 17 September 2012).
- Invasive Plant Council of New York. 2007. New York State Early Detection Invasive Plants by Region, Assessment of Naturalized Invasive Plants, Region LIISMA. Available at <http://www.ipcnys.org/files/ED%20Lists/LIISMA.pdf> (accessed 17 September 2012).
- James-Pirri, M. J., C. T. Roman, J. L. Swanson. 2010. A method to quantitatively sample nekton in salt marsh ditches and small tidal creeks. *Transactions of the American Fisheries Society* 139:413-419.
- James-Pirri, M. J., C. T. Roman, E. L. Nicosia. 2012. Monitoring nekton in salt marshes: A protocol for the National Park Service's Long-Term Monitoring Program, Northeast Coastal and Barrier Network. Natural Resource Report NPS/NCBN/NRR—2012/579. National Park Service, Fort Collins, Colorado.
- James-Pirri, M. J., C. T. Roman, and E. L. Nicosia. In Review. Monitoring vegetation 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.
- 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.
- 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.
- United States Department of Agriculture. 2012. Natural Resources Conservation Service. National Plant Data Team, Greensboro, NC. The PLANTS Database. Available at <http://plants.usda.gov/> (accessed 17 September 2012).

Wikum, D. A., G. F. Shanholtzer. 1978. Application of the Braun-Blanquet Cover-Abundance Scale for Vegetation Analysis in Land Development Studies. *Environmental Management* 2:323-329.

Young, S. M., ed. 2008. New York Rare Plant Status Lists. New York Natural Heritage Program. Available at http://www.dec.ny.gov/docs/wildlife_pdf/nynhprpsl.pdf (accessed 17 September 2012).

Appendix A: Coordinates for nekton stations at WIFL in 2011

Table A-1. Coordinates for nekton stations sampled at WIFL site 1 in 2011, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
WF1D17_2011	Unobstructed Ditch	683873	4514331
WF1D20_2011	Unobstructed Ditch	683923	4514253
WF1D23_2011	Obstructed Ditch	683843	4514378
WF1D24_2011	Obstructed Ditch	683940	4514227
WF1D27_2011	Obstructed Ditch	683776	4514356
WF1D3_2011	Obstructed Ditch	683808	4514368
WF1D4_2011	Obstructed Ditch	683749	4514358
WF1D6_2011	Unobstructed Ditch	683857	4514357
WF1D7_2011	Unobstructed Ditch	683890	4514305
WF1D9_2011	Obstructed Ditch	683907	4514279
WF1P001-2011	Pool / Panne	683788	4514455
WF1-P002_2011	Pool / Panne	683786	4514419
WF1P003_2011	Pool / Panne	683704	4514491

Table A-2. Coordinates for nekton stations sampled at WIFL site 2 in 2011, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
WF2D11_2011	Obstructed Ditch	684223	4514791
WF2D12_2011	Unobstructed Ditch	684301	4514629
WF2D14_2011	Unobstructed Ditch	684216	4514611
WF2D18_2011	Unobstructed Ditch	684329	4514622
WF2D2_2011	Unobstructed Ditch	684284	4514664
WF2D3_2011	Unobstructed Ditch	684268	4514769
WF2D4_2011	Unobstructed Ditch	684307	4514643
WF2D7_2011	Unobstructed Ditch	684261	4514685
WF2D8_2011	Unobstructed Ditch	684283	4514584
WF2D9_2011	Unobstructed Ditch	684247	4514740

Appendix A: Coordinates for nekton stations at WIFL in 2011 (continued)

Table A-3. Coordinates for nekton stations sampled at WIFL site 3 in 2011, UTM, Zone 18, NAD 83, meters.

Station ID	Habitat	UTM X (east)	UTM Y (north)
WF3D1_2011	Unobstructed Ditch	684143	4514465
WF3D10_2011	Unobstructed Ditch	683875	4514583
WF3D11_2011	Obstructed Ditch	683923	4514568
WF3D15_2011	Unobstructed Ditch	684099	4514484
WF3D3_2011	Unobstructed Ditch	684052	4514549
WF3D30_2011	Obstructed Ditch	683938	4514597
WF3D32_2011	Unobstructed Ditch	684021	4514493
WF3D37_2011	Unobstructed Ditch	684078	4514462
WF3D5_2011	Unobstructed Ditch	684097	4514507
WF3D8_2011	Obstructed Ditch	683960	4514575
WF3P004_2011	Pool / Panne	683805	4514554
WF3P005_2011	Pool / Panne	683850	4514578
WF3P006_2011	Pool / Panne	683830	4514541

Appendix B: Coordinates for vegetation plots at WIFL in 2011

Table B-1. Coordinates for vegetation plots sampled at WIFL site 1 in 2011, UTM, Zone 18, NAD 83, meters. '**' species listed as invasive or exotic in New York State was present.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
WF1V111_2011	683609	4514477	WF1V3411_2011	683790	4514337
WF1V1011_2011 *	683659	4514426	WF1V3511_2011	683815	4514347
WF1V1111_2011	683831	4514313	WF1V3611_2011	683804	4514395
WF1V1211_2011	683628	4514431	WF1V3711_2011	683732	4514505
WF1V1311_2011	683821	4514346	WF1V3811_2011	683602	4514402
WF1V1411_2011	683832	4514310	WF1V3911_2011	683586	4514352
WF1V1511_2011	683844	4514367	WF1V411_2011	683745	4514376
WF1V1611_2011	683710	4514376	WF1V4011_2011	683771	4514391
WF1V1711_2011	683704	4514493	WF1V4111_2011	683798	4514405
WF1V1811_2011	683754	4514441	WF1V4211_2011	683828	4514320
WF1V1911_2011	683580	4514374	WF1V4411_2011	683690	4514528
WF1V211_2011	683597	4514332	WF1V4511_2011	683871	4514286
WF1V2011_2011	683619	4514451	WF1V4611_2011	683911	4514267
WF1V2111_2011	683685	4514359	WF1V4811_2011	683747	4514468
WF1V2211_2011	683726	4514338	WF1V4911_2011	683737	4514489
WF1V2311_2011	683620	4514348	WF1V511_2011 *	683700	4514410
WF1V2411_2011	683711	4514469	WF1V5011_2011	683590	4514344
WF1V2511_2011	683844	4514369	WF1V5611_2011 *	683817	4514358
WF1V2711_2011	683788	4514332	WF1V5711_2011	683863	4514301
WF1V2811_2011	683851	4514345	WF1V5811_2011	683817	4514347
WF1V2911_2011 *	683664	4514506	WF1V5911_2011	683863	4514311
WF1V311_2011 *	683740	4514381	WF1V611_2011	683844	4514359
WF1V3011_2011	683628	4514420	WF1V711_2011	683627	4514340
WF1V3111_2011 *	683655	4514535	WF1V811_2011 *	683658	4514528
WF1V3211_2011	683576	4514385	WF1V911_2011	683853	4514338
WF1V3311_2011	683678	4514556			

Appendix B: Coordinates for vegetation plots at WIFL in 2011 (continued)

Table B-2. Coordinates for vegetation plots sampled at WIFL site 2 in 2011, UTM, Zone 18, NAD 83, meters. '+' species listed as exploitably vulnerable in New York State was present. '**' species listed as invasive or exotic in New York State was present.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
WF2V111_2011	684227	4514648	WF2V3411_2011 *	684170	4514724
WF2V1011_2011	684343	4514558	WF2V3511_2011	684292	4514676
WF2V1111_2011	684306	4514626	WF2V3611_2011	684353	4514574
WF2V1211_2011	684295	4514719	WF2V3711_2011	684343	4514579
WF2V1311_2011	684315	4514710	WF2V3811_2011	684239	4514684
WF2V1411_2011	684243	4514705	WF2V3911_2011	684196	4514664
WF2V1611_2011	684191	4514759	WF2V411_2011	684179	4514673
WF2V1711_2011	684247	4514750	WF2V4011_2011 *	684174	4514768
WF2V1811_2011	684251	4514746	WF2V4111_2011 *	684116	4514709
WF2V1911_2011 *	684223	4514648	WF2V4211_2011	684171	4514702
WF2V211_2011	684241	4514637	WF2V4311_2011	684246	4514637
WF2V2111_2011	684380	4514538	WF2V4411_2011	684141	4514648
WF2V2211_2011 *	684093	4514698	WF2V4511_2011	684222	4514718
WF2V2311_2011 *	684146	4514763	WF2V4611_2011	684370	4514589
WF2V2411_2011	684300	4514674	WF2V4711_2011	684311	4514645
WF2V2511_2011 +	684392	4514553	WF2V4811_2011	684158	4514631
WF2V2611_2011	684196	4514664	WF2V4911_2011	684374	4514515
WF2V2711_2011 *	684109	4514783	WF2V511_2011	684386	4514577
WF2V2811_2011	684287	4514679	WF2V5011_2011	684304	4514714
WF2V2911_2011	684347	4514644	WF2V5211_2011	684180	4514737
WF2V311_2011	684133	4514652	WF2V611_2011 *	684171	4514677
WF2V3011_2011	684129	4514748	WF2V711_2011	684168	4514702
WF2V3111_2011	684372	4514566	WF2V811_2011 *	684198	4514705
WF2V3211_2011	684175	4514721	WF2V911_2011	684181	4514743
WF2V3311_2011	684242	4514662			

Appendix B: Coordinates for vegetation plots at WIFL in 2011 (continued)

Table B-3. Coordinates for vegetation plots sampled at WIFL site 3 in 2011, UTM, Zone 18, NAD 83, meters. '+' species listed as exploitably vulnerable in New York State was present. '*' species listed as invasive or exotic in New York State was present.

Plot ID	UTM X (east)	UTM Y (north)	Plot ID	UTM X (east)	UTM Y (north)
WF3V111_2011	683818	4514582	WF3V3311_2011	683956	4514609
WF3V1011_2011	684019	4514440	WF3V3411_2011	683871	4514557
WF3V1111_2011	684279	4514338	WF3V3511_2011 *	684010	4514581
WF3V1211_2011	683951	4514610	WF3V3611_2011 *	683900	4514635
WF3V1311_2011	683828	4514577	WF3V3711_2011	684143	4514448
WF3V1411_2011 *	683972	4514622	WF3V3811_2011 +	684115	4514486
WF3V1511_2011	683885	4514548	WF3V3911_2011	683895	4514544
WF3V1611_2011	683936	4514618	WF3V411_2011 *	684006	4514608
WF3V1711_2011	684129	4514457	WF3V4011_2011 +	684120	4514483
WF3V1811_2011	683930	4514573	WF3V4111_2011	684024	4514437
WF3V1911_2011	683863	4514583	WF3V4211_2011	684071	4514483
WF3V211_2011	684044	4514544	WF3V4311_2011	683993	4514450
WF3V2011_2011	683957	4514606	WF3V4411_2011	684159	4514441
WF3V2111_2011	684016	4514556	WF3V4511_2011	683989	4514593
WF3V2211_2011	684109	4514464	WF3V4711_2011	684063	4514511
WF3V2311_2011	683949	4514519	WF3V4811_2011	684013	4514489
WF3V2411_2011	684246	4514332	WF3V4911_2011	684029	4514457
WF3V2511_2011	684044	4514473	WF3V511_2011	683962	4514559
WF3V2611_2011	683999	4514588	WF3V5011_2011	684002	4514540
WF3V2711_2011	683895	4514521	WF3V5111_2011	683955	4514516
WF3V2811_2011	683784	4514598	WF3V5211_2011 *	683990	4514637
WF3V2911_2011	684107	4514442	WF3V611_2011 *	683997	4514633
WF3V311_2011	683993	4514473	WF3V711_2011 *	683854	4514610
WF3V3111_2011 *	684037	4514593	WF3V811_2011	683941	4514616
WF3V3211_2011	683836	4514594	WF3V911_2011 +	684116	4514488

Appendix C: Nekton density summarized by site

Table C-1. (i) Average density and standard error [individuals per 1 m² ± SE (total count)] of nekton captured at WIFL in 2011. Data are summarized by site and sampling event as well as both events combined. (ii) Number of nekton stations summarized by site and sampling event.

Average Density [individuals per 1 m ² ± SE (total count)]			
Site	Event 1	Event 2	Events 1 & 2
1	9.1 ± 2.1 (121)	104.3 ± 57.5 (776)	56.7 ± 29.7 (897)
2	20.7 ± 11.2 (161)	171.3 ± 65.6 (1213)	96.0 ± 36.7 (1374)
3	17.6 ± 4.9 (160)	28.0 ± 9.1 (233)	22.8 ± 5.2 (393)

(ii)

Site	Event	No. of Stations
1	1	13
1	2	13
2	1	10
2	2	10
3	1	13
3	2	13

Appendix D. Nekton species richness summarized by site and sampling event

Table D-1. (i) Species richness (observed number of species) at WIFL in 2011. Data are summarized by site. (ii) Species richness (observed number of species) at WIFL in 2011. Data are summarized by site and sampling event.

(i)

Site	No. of Stations	Observed No. of Species
1	13	7
2	10	7
3	13	4

(ii)

Site	Event	No. of Stations	Observed No. of Species
1	1	13	6
1	2	13	5
2	1	10	3
2	2	10	7
3	1	13	4
3	2	13	3

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

Table E-1. (i) Nekton species and community composition at WIFL in 2011. Data are summarized by site. n = total number of nekton captured. '-' species or community was not present. (ii) Nekton species and community composition at WIFL in 2011. Data are summarized by site and sampling event. n = total number of nekton captured. '-' species or community was not present.

(i)

Life History Group/Species	Common Name	Group/Species Composition (%)		
		Site 1 (n = 897)	Site 2 (n = 1374)	Site 3 (n = 393)
Resident Fish		14.6	18.0	68.2
<i>Fundulus heteroclitus</i>	common mummichog	9.1	17.5	67.4
<i>Lucania parva</i>	rainwater killifish	3.5	0.5	-
<i>Cyprinodon variegatus</i>	sheepshead minnow	2.0	0.1	0.8
Resident Shrimp		84.4	81.1	30.8
<i>Palaemonetes pugio</i>	daggerblade grass shrimp	84.4	81.1	30.8
Transient Crustacean		0.4	0.2	1.0
<i>Callinectes sapidus</i>	blue crab	0.4	0.2	1.0
Transient Fish		0.4	0.5	-
<i>Menidia menidia</i>	Atlantic silverside	0.4	0.5	-
Unknown		0.1	0.1	-
Unknown Crab	unknown crab	-	0.1	-
Unknown Juvenile	unknown juvenile fish	0.1	-	-

Appendix E. Nekton species and community composition summarized by site and sampling event (continued)

Table E-1. (i) Nekton species and community composition at WIFL in 2011. Data are summarized by site. n = total number of nekton captured. '-' species or community was not present. (ii) Nekton species and community composition at WIFL in 2011. Data are summarized by site and sampling event. n = total number of nekton captured. '-' species or community was not present.

(ii)

Life History Group/Species	Common Name	Group/Species Composition (%)					
		Site 1		Site 2		Site 3	
		Event 1 (n = 121)	Event 2 (n = 776)	Event 1 (n = 161)	Event 2 (n = 1213)	Event 1 (n = 160)	Event 2 (n = 233)
Resident Fish		42.1	10.3	98.1	7.4	88.8	54.1
<i>Fundulus heteroclitus</i>	common mummichog	34.7	5.2	98.1	6.8	86.9	54.1
<i>Lucania parva</i>	rainwater killifish	-	4.0	-	0.6	-	-
<i>Cyprinodon variegatus</i>	sheepshead minnow	7.4	1.2	-	0.1	1.9	-
Resident Shrimp		51.2	89.6	0.6	91.8	10.0	45.1
<i>Palaemonetes pugio</i>	daggerblade grass shrimp	51.2	89.6	0.6	91.8	10.0	45.1
Transient Crustacean		2.5	0.1	1.2	0.1	1.2	0.9
<i>Callinectes sapidus</i>	blue crab	2.5	0.1	1.2	0.1	1.2	0.9
Transient Fish		3.3	-	-	0.6	-	-
<i>Menidia menidia</i>	Atlantic silverside	3.3	-	-	0.6	-	-
Unknown		0.8	-	-	0.1	-	-
Unknown Crab	unknown crab	-	-	-	0.1	-	-
Unknown Juvenile	unknown juvenile fish	0.8	-	-	-	-	-

Appendix F. Vegetation frequency summarized by site

Table F-1. Frequency of each species and cover type observed at WIFL in 2011. Data were summarized for each site and over all 150 plots. (NL) indicates standing non-living vegetation. ‘+’ species is exploitably vulnerable in New York State (USDA 2012, Young 2008). ‘*’ species is invasive or exotic in New York State (Invasive Plant Council of New York 2007). ‘#’ *S. virginica*, an invalid synonym was used on the field data sheet; the accepted synonym *S. depressa* was retrieved on 17 Sept 2012 (www.itis.gov).

Cover Type		Site (no. of plots)			
Salinity Tolerance		1	2	3	All
Species	Common Name	(51)	(49)	(50)	(150)
Vegetation		43	46	45	134
High Salinity Tolerance		43	46	44	133
<i>Spartina alterniflora</i>	saltmarsh cordgrass	35	42	39	116
<i>Spartina alterniflora</i> (NL)	saltmarsh cordgrass (NL)	33	33	33	99
<i>Spartina patens</i>	salt meadow cordgrass	16	13	20	49
<i>Spartina patens</i> (NL)	salt meadow cordgrass (NL)	12	12	16	40
<i>Distichlis spicata</i>	spikegrass	17	11	13	41
<i>Distichlis spicata</i> (NL)	spikegrass (NL)	18	9	9	36
<i>Salicornia maritima</i>	glasswort	11	10	8	29
<i>Iva frutescens</i>	marsh elder	4	5	4	13
<i>Iva frutescens</i> (NL)	marsh elder (NL)	1	--	1	2
<i>Limonium carolinianum</i> ⁺	sea lavender	--	1	1	2
<i>Limonium carolinianum</i> (NL) ⁺	sea lavender (NL)	--	--	2	2
<i>Solidago sempervirens</i>	seaside goldenrod	1	--	1	2
<i>Juncus gerardii</i>	black grass	2	3	--	5
<i>Juncus gerardii</i> (NL)	black grass (NL)	--	1	--	1
<i>Ruppia maritima</i>	widgeon grass	--	1	--	1
<i>Salicornia depressa</i> [#]	Virginia glasswort	4	2	--	6
Medium Salinity Tolerance		--	--	3	3
<i>Baccharis halimifolia</i>	Eastern baccharis	--	--	2	2
<i>Morella pensylvanica</i>	Northern bayberry	--	--	1	1
<i>Schoenoplectus pungens</i> var. <i>pungens</i>	common threesquare	--	--	1	1
<i>Toxicodendron radicans</i>	poison ivy	--	--	1	1
Low Salinity Tolerance		8	9	8	25
<i>Phragmites australis</i> [*]	common reed	7	9	8	24
<i>Phragmites australis</i> (NL) [*]	common reed (NL)	8	6	7	21
No Salinity Tolerance		--	--	1	1
<i>Elymus virginicus</i>	Virginia rye grass	--	--	1	1
<i>Quercus velutina</i>	black oak	--	--	1	1
<i>Smilax rotundifolia</i>	common greenbrier	--	--	1	1
Unknown Salinity Tolerance		--	--	1	1
<i>Unknown plant</i>	unknown plant	--	--	1	1
Non-Vegetation		41	37	38	116
water	water	36	14	24	74
bare ground	bare ground	7	30	23	60
Incidental Cover		12	29	21	62
Wrack & litter	wrack & litter	12	29	20	61
trash	garbage / trash	--	--	1	1

Appendix G. Vegetation relative percent cover summarized by site

Table G-1. Relative percent cover of each species and cover type observed at WIFL in 2011. Data were summarized by site and over all 150 plots. (NL) indicates standing non-living vegetation. '+' species is exploitably vulnerable in New York State (USDA 2012, Young 2008). '*' species is invasive or exotic in New York State (Invasive Plant Council of New York 2007). '#', *S. virginica*, an invalid synonym was used on the field data sheet; the accepted synonym *S. depressa* was retrieved on 17 Sept 2012 (www.itis.gov).

Cover Type		Relative % Cover			
Salinity Tolerance		Site (No. of Plots)			
Species	Common Name	1 (51)	2 (49)	3 (50)	All (150)
Vegetation		61.9	65.3	69.8	65.5
High Salinity Tolerance		60.0	62.9	63.3	62.0
<i>Spartina alterniflora</i>	saltmarsh cordgrass	21.0	27.9	27.0	25.1
<i>Spartina alterniflora</i> (NL)	saltmarsh cordgrass (NL)	11.6	9.9	11.8	11.1
<i>Spartina patens</i>	salt meadow cordgrass	7.5	8.4	9.4	8.4
<i>Spartina patens</i> (NL)	salt meadow cordgrass (NL)	7.6	10.4	10.2	9.3
<i>Distichlis spicata</i>	spikegrass	4.8	1.6	1.2	2.6
<i>Distichlis spicata</i> (NL)	spikegrass (NL)	4.8	1.3	1.7	2.7
<i>Iva frutescens</i>	marsh elder	1.7	2.3	1.2	1.7
<i>Iva frutescens</i> (NL)	marsh elder (NL)	0.2	-	< 0.05	0.1
<i>Salicornia maritima</i>	glasswort	0.3	0.6	0.3	0.4
<i>Juncus gerardii</i>	black grass	0.5	0.3	-	0.3
<i>Juncus gerardii</i> (NL)	black grass (NL)	-	< 0.05	-	< 0.05
<i>Solidago sempervirens</i>	seaside goldenrod	< 0.05	-	0.2	0.1
<i>Limonium carolinianum</i> ⁺	sea lavender	-	< 0.05	< 0.05	< 0.05
<i>Limonium carolinianum</i> (NL) ⁺	sea lavender (NL)	-	-	0.1	< 0.05
<i>Ruppia maritima</i>	widgeon grass	-	< 0.05	-	< 0.05
<i>Salicornia depressa</i> [#]	Virginia glasswort	< 0.05	0.1	-	< 0.05
Medium Salinity Tolerance		-	-	1.9	0.6
<i>Baccharis halimifolia</i>	Eastern baccharis	-	-	1.3	0.4
<i>Toxicodendron radicans</i>	poison ivy	-	-	0.5	0.2
<i>Morella pensylvanica</i>	Northern bayberry	-	-	< 0.05	< 0.05
<i>Schoenoplectus pungens</i> var. <i>pungens</i>	common threesquare	-	-	< 0.05	< 0.05
Low Salinity Tolerance		1.9	2.4	3.1	2.4
<i>Phragmites australis</i> [*]	common reed	1.5	2.2	2.6	2.1
<i>Phragmites australis</i> (NL) [*]	common reed (NL)	0.4	0.2	0.5	0.4
No Salinity Tolerance		-	-	1.5	0.5
<i>Quercus velutina</i>	black oak	-	-	1.3	0.4
<i>Smilax rotundifolia</i>	common greenbrier	-	-	0.2	0.1
<i>Elymus virginicus</i>	Virginia rye grass	-	-	< 0.05	< 0.05
Unknown Salinity Tolerance		-	-	< 0.05	< 0.05
Unknown plant	unknown plant	-	-	< 0.05	< 0.05
Non-Vegetation		35.6	26.0	20.3	27.6
water	water	34.1	10.2	17.0	21.1
bare ground	bare ground	1.5	15.9	3.3	6.5
Incidental Cover		2.6	8.7	9.9	6.9
Wrack & litter	wrack & litter	2.6	8.7	9.4	6.7
trash	garbage / trash	-	-	0.5	0.2

