



Monitoring Salt Marsh Vegetation at Gateway National Recreation Area's Sandy Hook Unit

2014 Summary Report

Natural Resource Data Series NPS/NCBN/NRDS—2015/793



ON THE COVER

Horseshoe Cove salt marsh at Gateway National Recreation Area's Sandy Hook Unit.
Photograph by: Robin Baranowski

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Erika L. Nicosia

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

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

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Abstract

The Northeast Coastal and Barrier Network (NCBN) began monitoring salt marsh vegetation and nekton at Gateway National Recreation Area's Sandy Hook Unit (GATE-SHU) in 2010. This report summarizes the third year of vegetation data collected during the summer of 2014. Nekton sampling was not conducted, and vegetation sampling was conducted at only one of the three established monitoring sites due to time and budget constraints.

Fifty vegetation plots were sampled on July 8, 2014. The percent cover of each vegetation species and non-vegetation cover type within each 1 m² plot was visually estimated using a revised Braun-Blanquet method. Fourteen vegetation species and five non-vegetation cover types were recorded.

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 data collected at Gateway National Recreation Area’s Sandy Hook Unit (GATE-SHU) in 2014 according to the protocol developed by James-Pirri et al. (In Review)—*Monitoring Salt Marsh Vegetation: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network*.

Methods

Permanent Site Selection

Three permanent monitoring sites were established for biennial monitoring at GATE-SHU in 2010 (Figure 1). In 2014, nekton sampling was not conducted, and vegetation sampling only occurred at Site 1 due to time and budget constraints. 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).



Figure 1. Permanent salt marsh monitoring sites established by NCBN at Gateway National Recreation Area's Sandy Hook Unit (GATE-SHU) in 2010. Salt marsh monitoring is conducted biennially.

Vegetation Plot Selection and Data Collection

Vegetation plots ($n = 50$) were sampled on July 8, 2014. Ten transects extending from bay to upland were systematically placed based on a single random start (James-Pirri et al. In Review). Plots were established by treating the total length of all ten transects as a single transect and randomly selecting points (*i.e.*, plots) along this total length. This combination of systematic transects and replicate plots is necessary to ensure interspersed of the plots throughout the marsh study area, thus providing a representative sample of all salt marsh communities (*e.g.*, low marsh, high marsh).

All vegetation species and non-vegetation cover types present in each plot were recorded (Table 1), 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 1. 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 (<i>e.g.</i> , <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 (<i>e.g.</i> , 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 (<i>e.g.</i> , <i>Fucus</i> , <i>Ascophyllum</i>). Microalgae (<i>e.g.</i> , 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

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 2) as described in Wikum and Shanholtzer (1978). A detailed description of the analyses and formulae are presented in the salt marsh vegetation protocol (James-Pirri et al. In Review).

Table 2. 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%	0.50%
2	1 - 5%	3%
3	6 - 25%	15.50%
4	26 - 50%	38%
5	51 - 75%	63%
6	76 - 100%	88%

Wikum and Shanholtzer (1978) outline a method for calculating an importance value for each species. So as not to confuse this value with ecological importance, 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.

Species are grouped by salinity tolerance (USDA 2015) to help characterize the vegetation community. Species listed by the United States Department of Agriculture (USDA), or the State of New Jersey as exotic, invasive, threatened, endangered, or rare are noted in the vegetation data summary. Information about individual plant species is available online (USDA 2015). Additional information about species listed as endangered or rare in the state of New Jersey is available on the New Jersey Natural Heritage Program website (<http://www.nj.gov/dep/parksandforests/natural/heritage/index.html>). The locations of sample plots where listed species were observed are noted in Appendix A.

Results

Vegetation

Fourteen vegetation species and five non-vegetation cover types were observed at GATE-SHU in 2014 (Table 3). During the data QC process, it was determined that the percent cover of dead vegetation was likely overestimated for some (if not all species) during the 2014 field season; therefore these data were removed from the summary presented in this report. The Network will be evaluating whether or not to continue identifying and recording dead vegetation in the future.

An official list of invasive species is not available for the state of New Jersey (USDA 2015); however, *Artemisia vulgaris* is listed on the NJ Invasive Species Strike Team's '2014 Do Not Plant List' (NJISST 2014). This species was observed in one plot at Site 1 (Appendix A).

Table 3. Average percent cover (Average % Cover $\pm$ SE), frequency, and relative percent prevalence of each vegetation species and non-vegetation cover type observed at GATE-SHU in 2014. Data were summarized over all 50 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). '*' indicates invasive species (NJISST 2014).

Cover Type						
Salinity Tolerance						
Species	Common Name	Avg. % Cover $\pm$ SE	Frequency	Rel. % Cover	Rel. % Freq.	Rel. % Prevalence
Vegetation		35.1 $\pm$ 4.3	36	29.6	34.7	32.1
High Salinity Tolerance		34.9 $\pm$ 4.3	36	29.4	31.3	30.3
<i>Spartina alterniflora</i>	saltmarsh cordgrass	28.2 $\pm$ 4.3	27	23.8	18.2	21.0
<i>Spartina patens</i>	salt meadow cordgrass	1.9 $\pm$ 1.1	4	1.6	2.7	2.2
<i>Iva frutescens</i>	marsh elder	1.6 $\pm$ 1.3	2	1.3	1.4	1.4
<i>Ammophila breviligulata</i>	American beachgrass	0.4 $\pm$ 0.3	3	0.4	2.0	1.2
<i>Ulva lactuca</i>	sea lettuce	1.8 $\pm$ 1.8	1	1.5	0.7	1.1
<i>Cakile edentula</i>	sea rocket	0.1 $\pm$ 0.1	2	0.1	1.4	0.8
<i>Limonium carolinianum</i>	sea lavender	0.1 $\pm$ 0.1	2	0.1	1.4	0.8
<i>Salicornia maritima</i>	glasswort	0.3 $\pm$ 0.3	2	0.3	1.4	0.8
<i>Atriplex patula</i>	spreading orache	0.1 $\pm$ 0.1	1	0.1	0.7	0.4
<i>Euphorbia polygonifolia</i>	seaside sandmat	0.1 $\pm$ 0.1	1	0.1	0.7	0.4
<i>Solidago sempervirens</i>	seaside goldenrod	0.1 $\pm$ 0.1	1	0.1	0.7	0.4
Medium Salinity Tolerance		0.1 $\pm$ 0.1	3	0.1	2.0	1.1
<i>Atriplex cristata</i>	crested saltbush	0.1 $\pm$ 0.1	3	0.1	2.0	1.1
Unknown Salinity Tolerance		0.1 $\pm$ 0.1	2	0.1	1.4	0.8
<i>Artemisia vulgaris</i> *	common wormwood	0.1 $\pm$ 0.1	1	0.1	0.7	0.4
<i>Suaeda</i> sp.	seepweed species	0.1 $\pm$ 0.1	1	0.1	0.7	0.4
Non-Vegetation		52.1 $\pm$ 5.8	42	43.9	39.2	41.5
bare ground	bare ground	27.4 $\pm$ 5.1	32	23.1	21.6	22.4
water	water	21.2 $\pm$ 5.1	17	17.9	11.5	14.7
pebble	pebble	3.5 $\pm$ 1.8	9	2.9	6.1	4.5
Incidental Cover		31.4 $\pm$ 4.9	31	26.5	26.4	26.4
wrack & litter	wrack / litter	30.6 $\pm$ 4.8	30	25.8	20.3	23.1
trash	garbage	0.7 $\pm$ 0.3	9	0.6	6.1	3.3

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Appendix A: Coordinates for vegetation plots sampled at GATE-SHU in 2014.

Table A-1. Coordinates for vegetation plots sampled at GATE-SHU Site 1 in 2014, UTM, Zone 18, NAD 83, meters. '*' indicates an invasive species (*Artemisia vulgaris*) was present (NJISST 2014).

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
GSH1V1014_2014	584667	4478222	GSH1V3314_2014	584768	4478048
GSH1V1114_2014	584707	4478094	GSH1V3414_2014	584594	4478077
GSH1V114_2014	584619	4478047	GSH1V3514_2014	584632	4478123
GSH1V1214_2014	584757	4478158	GSH1V3614_2014	584665	4478100
GSH1V1314_2014	584597	4478202	GSH1V3714_2014	584624	4478172
GSH1V1414_2014	584846	4478024	GSH1V3814_2014	584800	4478210
GSH1V1514_2014	584775	4478119	GSH1V4114_2014	584866	4478111
GSH1V1614_2014	584849	4478086	GSH1V414_2014*	584793	4478019
GSH1V1714_2014	584675	4478060	GSH1V4214_2014	584851	4478032
GSH1V1814_2014	584820	4478109	GSH1V4314_2014	584803	4478031
GSH1V1914_2014	584859	4478103	GSH1V4514_2014	584676	4478118
GSH1V2014_2014	584839	4478074	GSH1V4614_2014	584751	4478093
GSH1V2114_2014	584802	4478089	GSH1V4714_2014	584760	4478159
GSH1V214_2014	584697	4478082	GSH1V4814_2014	584645	4478139
GSH1V2314_2014	584663	4478218	GSH1V5114_2014	584628	4478301
GSH1V2414_2014	584724	4478058	GSH1V514_2014	584790	4478140
GSH1V2514_2014	584842	4478138	GSH1V5314_2014	584681	4478184
GSH1V2614_2014	584833	4478067	GSH1V5414_2014	584773	4478181
GSH1V2714_2014	584771	4478113	GSH1V5514_2014	584755	4478034
GSH1V2814_2014	584678	4478120	GSH1V5614_2014	584868	4478051
GSH1V2914_2014	584743	4478078	GSH1V5714_2014	584756	4478034
GSH1V3014_2014	584699	4478024	GSH1V5814_2014	584763	4478165
GSH1V3114_2014	584726	4478122	GSH1V614_2014	584754	4478208
GSH1V314_2014	584760	4478159	GSH1V814_2014	584679	4478184
GSH1V3214_2014	584820	4478173	GSH1V914_2014	584685	4478071

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1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

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