

**Northeast Coastal and Barrier Network**  
**Protocol Development Summary**  
(May 2009)

**Protocol:** Monitoring Salt Marsh Vegetation: A Protocol for the National Park Service's Long-Term Monitoring Program, Northeast Coastal and Barrier Network

**This protocol will be implemented in the following parks:**

- Cape Cod NS
- Gateway NRA
- Fire Island NS
- Sagamore Hill NHS
- Assateague Island NS
- George Washington Birthplace NM
- Colonial NHP

**Justification/Issues being addressed:**

A large percentage of the nation's salt marshes have been altered, degraded, and lost over the past century. Salt marshes have a long history of alteration from extensive networks of ditching for mosquito control or salt hay farming purposes, and from restriction of tidal exchange by roads, causeways, bridges, and dikes, (Daiber 1986, Roman et al. 2000). As the coastal corridor becomes urbanized watersheds become increasingly developed and salt marsh acreage declines and becomes fragmented. Urbanization leads to increases in septic and sewer systems, air pollution, and intensified recreational use of coastal areas.

Seven out of eight Northeast Coastal and Barrier Network parks identified salt marsh monitoring and restoration in either their General Management or Resource Management Plans. The Network's science committee also identified salt marsh as a key ecosystem to be included in the Networks Vital Signs Monitoring program. Salt marshes (1) buffer coastlines from erosion (2) reduce nutrient input to estuarine and coastal ecosystems by filtering land-derived runoff, (3) act as nursery grounds for important commercial and recreational fishes and species integral to the estuarine trophic food web. Salt marsh communities are sensitive to disturbance and perturbations (storms, geomorphic processes, nutrient loading, watershed development, and human activities such as tidal restrictions and ditching). By developing and implementing a protocol for long-term monitoring of salt marsh vegetation within NCBN parks, changes in salt marshes will be tracked over time and our understanding of the dynamics of this ecosystem further advanced.

**Specific Monitoring Questions and Objectives:**

**Objective 1: Identify long-term trends in salt marsh vegetation community structure**

- **Question 1:** *Are salt marsh vegetation patterns changing over time (e.g., decades)?*

- **Vital Sign 1:** Salt marsh vegetation community structure
- **Question 2:** *How do salt marsh communities change in response to acute perturbations (e.g. oil spills, storms) in the environment?*
  - **Vital Sign 1:** Salt marsh vegetation community structure

**Objective 2: Identify factors contributing to observed vegetation changes**

- **Question 1:** *What factors are contributing to observed vegetation changes (e.g., altered hydrology, nutrients, salinity)?*
  - **Vital Sign 1:** Groundwater dynamics
  - **Vital Sign 2:** Water chemistry

**Vital Signs, measurements, justifications and basic approach:**

**Vital Sign:** Salt marsh vegetation community structure

- **Measurements:** Species composition and percent cover.
- **Justification:** Baseline data on salt marsh vegetation community composition will assist with natural resource damage assessment and mitigation in the event of human-induced or natural catastrophic event such as oil spills or storms. A large percentage of the Nation's salt marshes have been altered, degraded, and lost over the past century. Restoration and subsequent monitoring of salt marsh habitat has recently become a management tool to rectify past environmental change.

**Vital Sign:** Groundwater dynamics

- **Measurements:** Water table level
- **Justification:** Water table level provides information on the amount of waterlogging or drainage that is occurring in a marsh. Water table level is an important parameter to use when attempting to understand why vegetation is changing.

**Vital Sign:** Water chemistry

- **Measurements:** Soil water salinity
- **Justification:** Soil water salinity is an important factor controlling the patterns of salt marsh vegetation. Salt marsh vegetation occurs in bands on the marsh, based on the tolerance of plants for submergence and salinity.

**Basic Approach:**

Salt marsh vegetation community monitoring will be implemented in seven NCBN parks. Within each study marsh, 35 to 50 vegetation plots will be established depending on the size of the marsh. The Braun-Blanquet method will be used to determine the percent cover of each species of vegetation present in the plots. Vegetation sampling will be conducted in August to early September, during the peak growing season.

**Protocol Authors:**

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**NPS Lead:**

NCBN implementation is directed by the NCBN Program Manager, Sara Stevens, NCBN - National Park Service, University of Rhode Island Coastal Institute in Kingston, #105, 1 Greenhouse Road, Kingston, RI 02881. Implementation of the salt marsh vegetation monitoring protocol is being managed by Erika Patenaude, Research Associate, University of Rhode Island Coastal Institute in Kingston, #105, 1 Greenhouse Road, Kingston, RI 02881 through a cooperative agreement between the National Park Service and the University of Rhode Island. Data and database management is directed by the NCBN Data Manager, Dennis Skidds, NCBN - National Park Service, University of Rhode Island Coastal Institute in Kingston, #105, 1 Greenhouse Road, Kingston, RI 02881.

**Protocol Development Status:**

The original protocol (Roman *et al.* 2001) was developed at Cape Cod National Seashore, an NPS prototype monitoring park. As part of the Inventory and Monitoring Program, the original Cape Cod protocol was tested at 9 National Parks within the Northeast Coastal and Barrier Network and the Northeast Temperate Network, during the summers of 2003-2005. After the testing phase, the protocol was re-assessed for feasibility, logistics, and statistical robustness. The sample design was modified to broaden the statistical inference to the Park level and to increase the statistical robustness of the data. This revised sampling design was implemented at Assateague NS, George Washington Birthplace NM, and Colonial NHP in the summer of 2008, and will be implemented at Fire Island NS and Sagamore Hill NHS in 2009. The salt marsh vegetation protocol is expected to be implemented in all selected NCBN parks by the end of the 2010 field season.

This protocol is being prepared for peer review. Please contact the NCBN Program Manager, Sara Stevens, NCBN - National Park Service, University of Rhode Island Coastal Institute in Kingston, #105, 1 Greenhouse Road, Kingston, RI 02881.

**Literature Cited**

Daiber, F.C. 1986. Conservation of Tidal Marshes. Van Nostrand Reinhold Co., New York.

Roman, C.T., M.J. James-Pirri, and J. F. Heltshe. 2001. Monitoring Salt Marsh Vegetation: A Protocol for the Long-term Coastal Ecosystem Monitoring Program at Cape Cod National Seashore. Coordinated by the USGS Patuxent Wildlife Research Center, Coastal Research Field Station at the University of Rhode Island, Narragansett, RI 02882.

Roman, C.T., N. Jaworski, F.T. Short, S. Findlay, and R.S. Warren. 2000. Estuaries of the northeastern United States: habitat and land use signatures. *Estuaries* 23: 743-764.