

Northeast Coastal and Barrier Network Protocol Development Summary

(Oct. 2010)

Protocol: Monitoring Salt Marsh Sediment Elevation: 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
- Assateague Island NS
- George Washington Birthplace NM
- Colonial NHP

Justification/Issues being addressed:

Tidal salt marshes are major ecosystem components of coastal park units throughout the northeast and are considered critical coastal resources by managers at NCBN parks. Tidal salt marshes provide essential nursery habitat for fisheries species, habitat for migratory shorebird and waterbird populations, traps for nutrients and sediments running off adjacent uplands, and buffers for coastal erosion and storm impacts (Mitsch and Gosselink 2000). Roman et al. (2001) recognized that the long-term sustainability of these ecosystems is threatened by predicted acceleration in the rate of sea-level rise if the marshes cannot build vertically at a similarly accelerated rate. The mean elevation of salt marsh surfaces must increase to keep pace with the annual rise in sea level and subsidence of salt marsh organic substrates. If the sedimentation rates in a salt marsh do not equal or exceed the net loss in elevation due to the steady increase in sea level and salt marsh subsidence, it will "drown". When a salt marsh "drowns", the surface of the marsh becomes sub-tidal which can cause drastic habitat changes such as the conversion of vegetated salt marsh to unvegetated mud flat. Salt marsh integrity and the ability of salt marshes to build vertically as sea level rises are further impacted by human activities, such as dikes, which can contribute to loss of salt marsh habitat.

As recognized by Roman and Barrett (1999), understanding changes in relative salt marsh elevation is important for interpreting changes in salt marsh vegetation communities and other estuarine ecosystem components. Salt marsh erosion and accretion are also important parameters for measuring the response of formerly impounded marshes to restoration of tidal influence, and will be particularly critical if the rate of sea level rise accelerates as predicted.

In addition to monitoring sediment elevation changes in NCBN salt marshes, this project is also part of a worldwide effort to monitor sea level rise with sediment erosion tables (SETs) (Boumans and Day Jr. 1993) and cryogenic coring devices (Cahoon et al. 1996). These two techniques measure both vertical accretion and elevation trends, and allow managers to calculate

subsurface process influences such as compaction and soil organic matter accumulation on elevation trends.

Specific Monitoring Questions and Objectives:

Objective 1: Identify long-term trends in salt marsh sediment elevation

- **Question 1:** *Are salt marsh sediment elevations changing over time?*
 - **Vital Sign 1:** Salt marsh sediment elevation change
- **Question 2:** *Are salt marsh sediments accreting or eroding over time?*
 - **Vital Sign 1:** Salt marsh sediment elevation change

Vital Signs, measurements, justifications and basic approach:

Vital Sign: Salt marsh sediment elevation change

- **Measurements:** Relative elevation, sediment accretion.
- **Justification:** Salt marsh sediment elevation is an important factor determining the distribution of salt marsh vegetation, which in turn determines the marsh's ability to serve as critical wildlife habitat, buffer against the effects of storms, etc.

Basic Approach:

Salt marsh sediment elevation change is measured using SETs; sediment accretion is measured using marker horizons and either cryogenic corers or the "marsh plug" method. Both these techniques are described in detail at the USGS SET web site at: <http://www.pwrc.usgs.gov/resshow/cahoon/>. Data are collected at least once per year.

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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 sediment elevation monitoring protocol is being managed by Donald R. Cahoon, United States Geological Survey Patuxent Wildlife Research Center Beltsville Lab, Beltsville, MD 20705 through a cooperative agreement between the National Park Service and the United States Geological Survey. 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:

An original protocol 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 has been tested at multiple National Parks within the Northeast Coastal and Barrier Network, Northeast Temperate Network, National Capital Region Network, and others. A draft protocol, adapted for GATE, FIIS, ASIS, GEWA, and COLO, is expected in 2011. The salt marsh sediment elevation monitoring protocol is expected to be implemented in all selected NCBN parks by the end of the 2011 field season. 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:

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