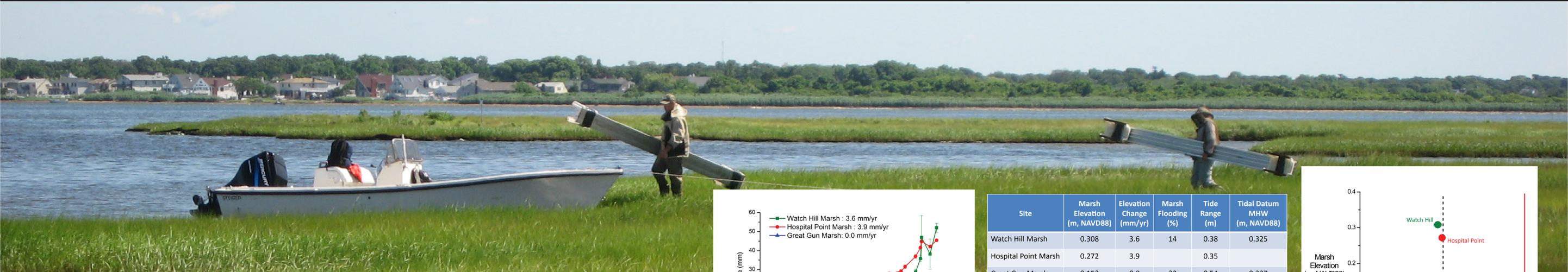


# A decade of monitoring the response of salt marsh elevation to sea-level rise at Fire Island

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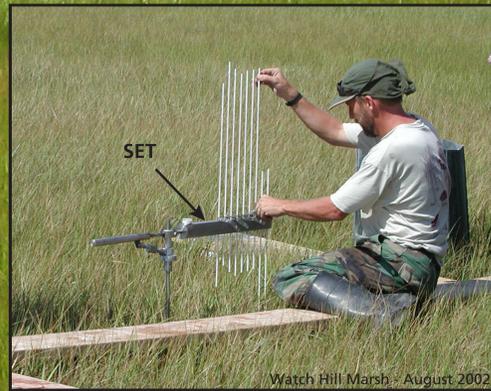


**PURPOSE:**  
The National Park Service, Northeast Coastal and Barrier Network, has been monitoring salt marsh elevation change at Fire Island National Seashore for over 11 years (beginning in 2002 and expected to continue for the long-term). Salt marshes must maintain elevation relative to sea-level rise or they may convert to sparsely vegetated marsh, mudflat, or open water environments. Monitoring of marsh elevation relative to sea-level rise provides an indication of the future sustainability of the marshes.

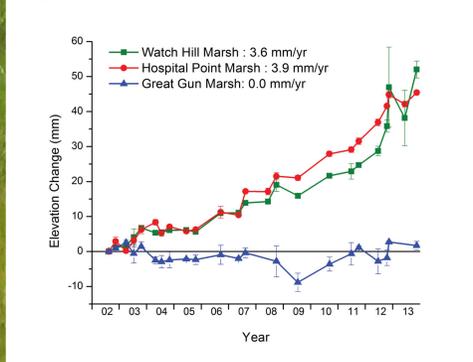
**METHODS:**  
The Surface Elevation Table (SET) method, employed in tidal wetlands throughout the world, enables very precise measurement of marsh elevation change over time. Nine SETs at Fire Island are being measured twice a year (3 marshes locations with 3 SETs each).

Elevation measurements (NAVD88) at each monitoring site were collected using Trimble RTK survey equipment in 2013.

Local hydrology was monitored using water level recorders (Hobo loggers, Onset Computer Corp.).



Watch Hill Marsh - August 2002

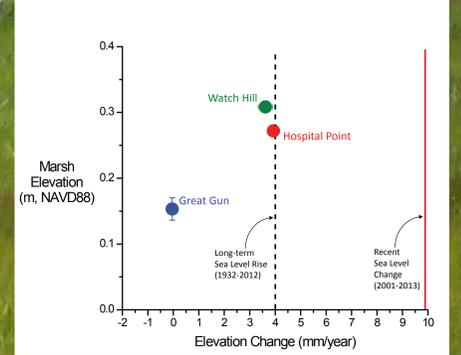


**FINDINGS:**  
**Elevation Change at 3 sites**  
During the 11-yr monitoring period, the marsh at the Watch Hill and Hospital Point sites has increased in elevation at a rate of 3.6 and 3.9 mm/year, respectively.  
  
The Great Gun marsh monitoring site has had no change in elevation over the monitoring period. However, it should be noted that a tidal creek began to form and migrate into the SET sites during the monitoring period, contributing to scouring and loss of vegetation. This is a localized effect and not representative of the larger Great Gun marsh area.

Site	Marsh Elevation (m, NAVD88)	Elevation Change (mm/yr)	Marsh Flooding (%)	Tide Range (m)	Tidal Datum MHW (m, NAVD88)
Watch Hill Marsh	0.308	3.6	14	0.38	0.325
Hospital Point Marsh	0.272	3.9	0.35		
Great Gun Marsh	0.153	0.0	32	0.54	0.337

**FINDINGS:**  
**Table of Marsh Elevation, Elevation Change Rate, % marsh flooding, MHW tidal datum**

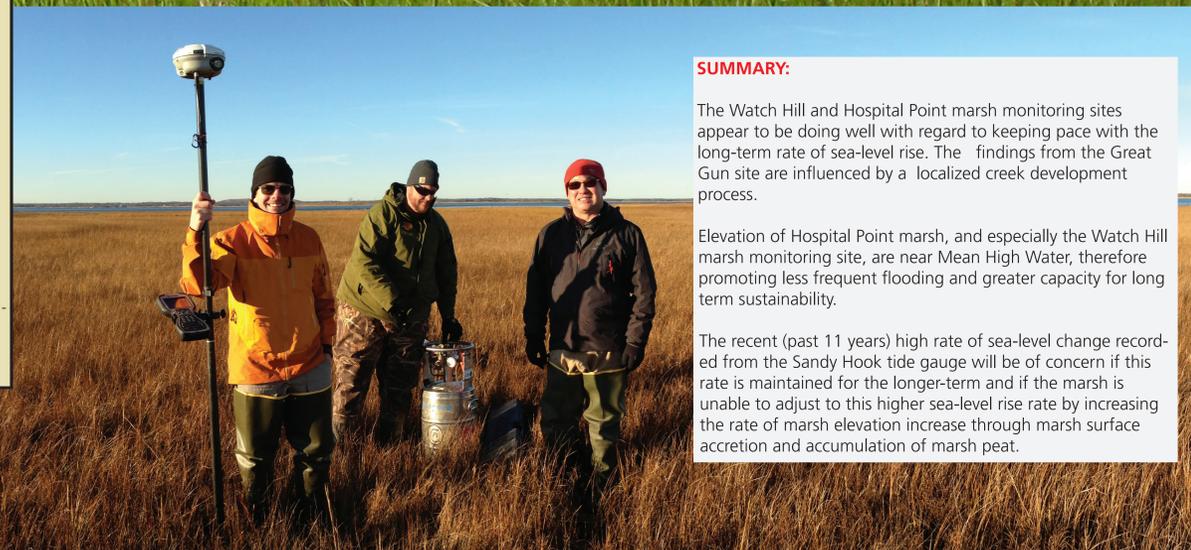
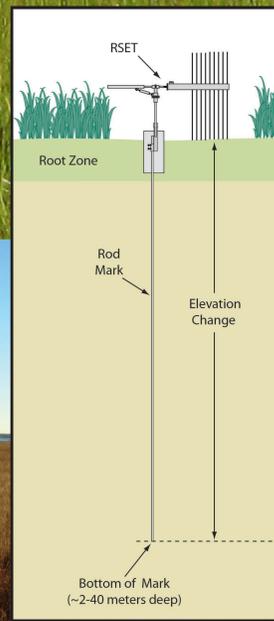
Average elevation of the marsh surface at the Great Gun site is much lower than at Watch Hill or Hospital Point due to the development of a creek. Due to this lower elevation, the marsh surface is flooded by tidal waters about 32% of time (e.g., flooded for 32% of a 12 hr tidal cycle), thus the much wetter conditions than at Watch Hill (flooded 14% time) or Hospital Point.



**FINDINGS:**  
**Marsh Elevation vs Elevation Change plot**  
Marsh elevation and marsh elevation change data becomes most relevant when compared to local rates of sea-level rise.  
  
Over the 11-year monitoring period, elevation change at the Watch Hill and Hospital Point marshes are comparable to the long-term rate of sea-level rise measured at the nearby Sandy Hook, NJ, NOAA tide gauge (4 mm/year, 80 year record). These monitoring sites are keeping pace with the long-term rate of sea-level rise.  
  
The Great Gun monitoring site, with 0.0 mm/year of marsh elevation change, is clearly not keeping pace with the long-term rate of sea-level rise. It is also noted that the elevation of the Great Gun site, compared to the other sites, is lower; thus the greater duration of tidal flooding and wetter conditions.  
  
The short-term rate of sea-level rise, calculated over the 11 year period of the SET monitoring, is much greater than the long-term sea-level rise record; 10 mm/year vs. 4 mm/year. Salt marshes can tolerate a short-term deficit in elevation relative to the rate of sea-level rise, but over the longer-term marshes need to keep pace or may convert to wetter conditions.



**STUDY SITES:**  
Three salt marsh sites on Fire Island are being monitored, each at a varying distance from Moriches Inlet.



**SUMMARY:**  
The Watch Hill and Hospital Point marsh monitoring sites appear to be doing well with regard to keeping pace with the long-term rate of sea-level rise. The findings from the Great Gun site are influenced by a localized creek development process.  
  
Elevation of Hospital Point marsh, and especially the Watch Hill marsh monitoring site, are near Mean High Water, therefore promoting less frequent flooding and greater capacity for long term sustainability.  
  
The recent (past 11 years) high rate of sea-level change recorded from the Sandy Hook tide gauge will be of concern if this rate is maintained for the longer-term and if the marsh is unable to adjust to this higher sea-level rise rate by increasing the rate of marsh elevation increase through marsh surface accretion and accumulation of marsh peat.

Hospital Point Marsh - November 2013