



# Narragansett Bay National Estuarine Research Reserve Sentinel Site:

## Effects of Sea Level Rise on Salt Marshes



### PURPOSE

Salt marshes in Rhode Island currently face multiple threats, including increasing rates of sea level rise combined with years of anomalously high tides. If marshes are unable to keep up with rising sea levels, these wetlands will likely be impacted by shifts in vegetation, high marsh ponding, creek sloughing, and eventually, drowning.

Long-term monitoring data are important if we are to understand the comprehensive impacts from this projected inundation, and if coastal managers are to be successful in their attempts to protect and restore marshes from further climate change-induced degradation.

Although some monitoring components date back to 2000, new data sets on marsh responses to sea level rise are now available, thanks to the Research Reserve's Sentinel Site observations, which became fully operational in 2012. This Research Reserve, located on Prudence, Patience, Hope, and Dyer Islands in the geographic center of Narragansett Bay, represents a partnership between NOAA and the State of Rhode Island's Department of Environmental Management.

### SENTINEL SITE INFRASTRUCTURE

Monitoring infrastructure is located in the Coggeshall and Nag salt marshes, which are prime examples of intact mid-bay salt marshes. These sites will serve as long-term sentinel sites to evaluate how natural salt marshes change over time in response to global climate change and sea level rise. The infrastructure to collect observations includes tools to monitor vegetation, water levels, and elevation.

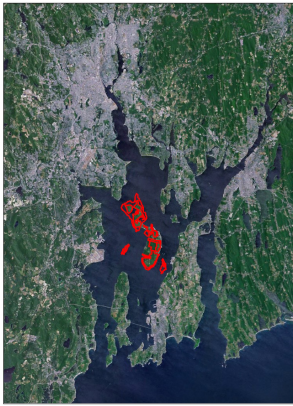
### MONITORING TOOLS

- Six vegetation monitoring transects (three in each marsh) stretch from estuary to upland to quantify changes in marsh vegetation structure over time.
- Twelve surface elevation tables (six in each marsh) are paired with marker horizons to track salt marsh elevations and accretion rates over time.
- Hydrology and sediment monitoring instruments quantify water table levels, salinity, and sediment characteristics within both salt marshes.
- New water level logging stations—tied to the North American Vertical Datum of 1988 (NAVD 88)—quantify water levels over time and ultimately derive localized tidal datums for each marsh.
- A local vertical control network, including new elevation benchmarks, aligns all marsh elevation data with NAVD88, the official vertical datum in the National Spatial Reference System for the conterminous United States and Alaska.
- Elevation data are gathered using real-time kinematic GPS and Leica digital leveling equipment to confirm the stability of monitoring infrastructure and track changes in the elevation of marsh habitats over time.
- Annual monitoring of nekton, or free-swimming aquatic animals, tracks responses of resident fishes, crustaceans, and mollusks to changes in marsh conditions.
- A water quality station (from the System-Wide Monitoring Program) in Nag Marsh and a reserve weather station at nearby Potter Cove provide complementary water quality and meteorology data.

### OUTCOMES

- Enhanced local tidal datum and estimated rates of relative sea level rise
- Improved understanding of effects of increasing rates of sea level rise on Rhode Island salt marshes
- Estimates of salt marsh accretion rates to determine if marshes are keeping up with sea level rise
- Reference marsh data to evaluate the success of numerous restoration projects throughout Narragansett Bay, particularly those undertaken by the Research Reserve's partner Save The Bay
- Improved collaboration with local scientific and management partners also working in salt marshes

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### PARTNERS:

NOAA National Estuarine Research Reserves

NOAA National Geodetic Survey

NOAA Center for Operational Oceanographic Products and Services

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