

Mud on the Move: Predicting how Marshes will Change as Sea Levels Rise

Project Location

San Francisco Bay National Estuarine Research Reserve, California

Project Lead

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Targeted End Users and Products

- Project final report

Project Partners

- *Grand Bay Reserve*
- *North Inlet-Winyah Bay Reserve*
- *San Francisco Bay Reserve*
- *California Sea Grant*
- *California State Coastal Conservancy*
- *NOAA Office for Coastal Management*
- *Point Blue Conservation Science*
- *San Francisco Bay Joint Venture*
- *University of South Carolina*
- *University of Alabama*
- *University of San Francisco*
- *USGS Pacific Coastal and Marine Science Center*

About the Science Collaborative

The National Estuarine Research Reserve System's Science Collaborative supports collaborative research that addresses coastal management problems important to the reserves. Learn more at www.nerrs.noaa.gov.

Overview

Healthy tidal marshes support the food webs that underpin our fisheries; they mitigate the impact of coastal storms, and they improve water quality. However, as sea levels rise, marshes are at risk from “drowning.” To survive, marshes must maintain their elevation relative to surrounding waters. They do this, in part, through accretion, a process by which sediment suspended in the water accumulates on the marsh’s surface. For marshes to survive, accretion must keep pace with sea level rise. Making decisions to support marsh sustainability depends on the ability to accurately measure suspended sediment concentrations, yet current monitoring programs lack well-tested, effective approaches to doing so. The project team addressed this gap by developing a protocol to assess suspended sediment in tidal marshes, improve understanding of sediment dynamics, increase accuracy of ecological models, and inform marsh conservation and restoration for the future.

Project Benefits

- A standardized, nationally applicable protocol to measure suspended sediment concentrations above tidal wetlands that is informing marsh monitoring, conservation, and restoration in the reserve system and beyond.
- Developed a new tool to enhance the reserves’ Sentinel Site Program, allowing standardized comparisons of suspended sediment inputs across a wide range of estuarine wetlands, and when coupled with other physical measurements, enabling more detailed research into how sediment moves through wetlands.
- Illustrated the importance of suspended sediment concentration data in improving wetland accretions models.

Project Approach

The San Francisco Bay reserve worked with coastal managers, monitoring programs, and scientists to develop and test a standardized sampling protocol to assess suspended sediment concentration in tidal marshes, refine inputs to marsh accretion models, and support more effective marsh management in the context of sea level rise.

Project Approach (continued)

- **Methodology:** To develop the protocol, the team modified and refined a previously established sampling methodology through repeated suspended sediment concentration sampling in San Francisco Bay area marshes. Researchers partnered with the Grand Bay and North Inlet-Winyah Bay reserves to test and apply the protocol at each reserve and explore how differences in tidal regimes, marsh characteristics, and vegetation affects protocol implementation.
- **Modeling:** Using the San Francisco Bay marsh data as inputs into three wetland accretion models commonly used by decision-makers, researchers compared model outputs and assessed how data from the refined protocol changed the models' predictions.
- **Stakeholder engagement:** Team members hosted workshops and conducted an online survey to solicit input on stakeholders' interests, needs, and understanding of suspended sediment concentration sampling methods and wetland accretion models. The protocol was widely distributed to regional and national scientific and tidal wetland management communities ensuring the protocol was widely available.

