



Thin-layer Sediment Placement: Evaluating an Adaptation Strategy to Enhance Coastal Marsh Resilience Across the National Estuarine Research Reserve System

Overview

Project Location

Chesapeake Bay Maryland National Estuarine Research Reserve
Chesapeake Bay Virginia National Estuarine Research Reserve
Elkhorn Slough National Estuarine Research Reserve
Great Bay National Estuarine Research Reserve
Narragansett Bay National Estuarine Research Reserve
North Carolina National Estuarine Research Reserve
San Francisco National Estuarine Research Reserve
Waquoit Bay National Estuarine Research Reserve

Project Duration

November 2017 to October 2019

Project Lead

Kenny Raposa
Narragansett Bay National Estuarine Research Reserve
(401) 683-7849
kenny@nbnerr.org

Project Type

Collaborative Research – generating science that informs decisions

Project Partners

- Chesapeake Bay Maryland National Estuarine Research Reserve
- Chesapeake Bay Virginia National Estuarine Research Reserve
- Drexel University
- Elkhorn Slough National Estuarine Research Reserve
- Great Bay National Estuarine Research Reserve
- Narragansett Bay National Estuarine Research Reserve
- North Carolina National Estuarine Research Reserve
- Roca Communications+, LLC
- San Francisco National Estuarine Research Reserve
- Waquoit Bay National Estuarine Research Reserve

Tidal marshes provide key ecosystem services—and they are increasingly threatened by sea level rise. Narragansett Bay and Elkhorn Slough National Estuarine Research Reserves recently led the first national assessment of tidal marsh resilience to sea level rise by developing and applying multi-metric indices to 16 reserve sites. Now the group is moving beyond marsh resilience monitoring and assessment efforts to actively test strategies to enhance resilience.

Through this project, replicated restoration experiments are being conducted at several reserve sites across the nation, with the purpose of examining the effectiveness of thin-layer sediment placement as a marsh adaptation strategy. Novel aspects of the project include the broad distribution of sites, the examination of the effectiveness of thin-layer sediment placement at different marsh elevations, a standardized monitoring protocol, and the incorporation of biochar (carbon material produced through the conversion of biomass in an oxygen limited environment) to improve soils and plant health.

Beneficial use of dredged sediment to enhance coastal resilience is of interest to, and already being applied in, many coastal states. At project conception, the team interviewed and surveyed end users involved in funding, permitting, implementation, and monitoring of thin-layer sediment projects. This project will address the needs end users identified, including a vetted monitoring protocol to assess restoration success after thin-layer sediment placement, a synopsis of associated permitting issues, and an evaluation of effectiveness of different treatments detailed in a technical report and summarized in a brochure and webinar.

Anticipated Benefits

The overarching goal of the project is to enhance salt marsh resilience by filling critical data gaps and providing information that will allow future thin-layer sediment placement projects to move forward more efficiently, in places where they will be most effective. Anticipated benefits include the following:

- Development of a national framework for enhancing coastal resilience through thin-layer sediment placement;
- Improved site selection and enhanced effectiveness of future sediment addition projects;
- Standardized monitoring across future projects; and
- Establishment of appropriate performance measures.

Project Approach

A collaborative learning approach will be used to structure and manage a process that encourages and accommodates effective ongoing collaboration and iteration between the project team and end users, to ensure participation at all stages of project. The core research questions of the project articulated by end users include the following:

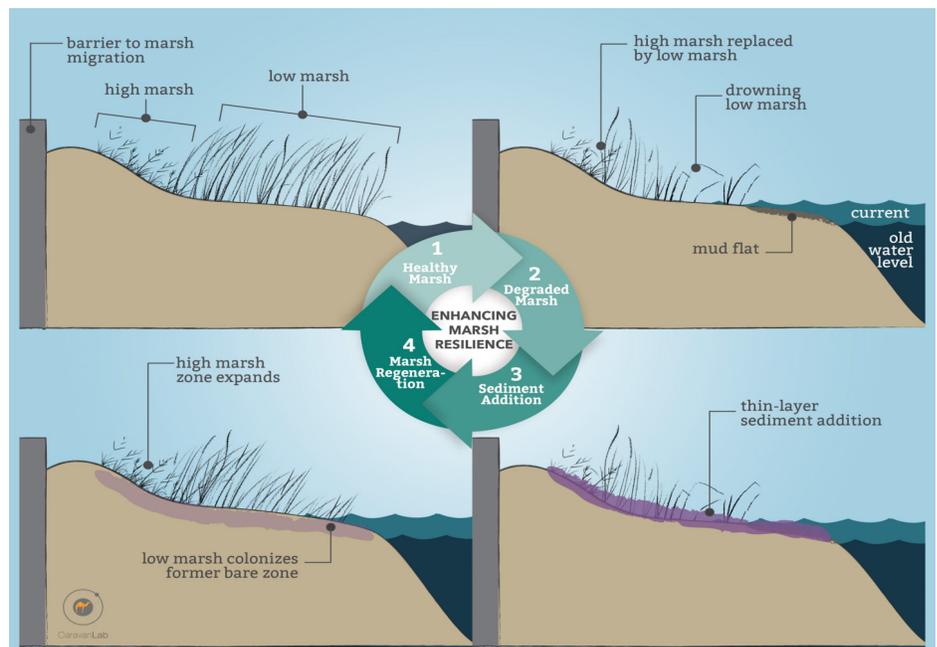
- Is sediment addition an effective adaptation strategy for marshes in the face of sea level rise?
- How does marsh resilience respond to different levels of sediment addition? and
- How do low versus high marsh habitats differ in their response to this restoration strategy?

The experimental design of the project will largely follow the before-after-control-impact approach, which will require monitoring both before and after sediment addition in experimental plots and in additional plots to serve as experimental controls. Within this design, the team will evaluate marsh responses to sediment addition at two different levels of two factors—marsh elevation and sediment thickness—that managers must consider when implementing sediment addition projects.

Targeted End Users and Anticipated Products

End users include reserve staff, particularly management and stewardship staff eager to implement on-the-ground action to enhance resilience of estuarine ecosystems; partners managing marshes near reserve sites, including numerous regional coastal management organizations; and national organizations involved with funding, policy, implementation, or monitoring of coastal management strategies. Outputs are those identified as most valuable to end users, and include the following:

- Technical report detailing the restoration methods, experimental design, monitoring results, and lessons learned to inform future projects;
- Easily transferrable protocol for monitoring of projects to enhance marsh resilience through sediment addition;
- Consensus statement on thin-layer sediment addition identifying conditions and sites where this strategy will be most successful in bolstering marsh resilience;
- Synopsis of permitting considerations;
- Webinar on lessons learned; and
- User-friendly summary, presentations, and outreach materials.



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. The Science Collaborative is managed by the University of Michigan's Water Center through a cooperative agreement with the National Oceanic and Atmospheric Administration (NOAA). Funding for the research reserves and this program comes from NOAA. Learn more at coast.noaa.gov/nerrs or graham.umich.edu/water/nerrs.