

Dataset Description: Thin-Layer Sediment Placement in Coastal Marshes Monitoring and Experimental Data

This document provides detailed information about three datasets that were generated through the 2017-2020 collaborative research project *Thin-Layer Sediment Placement: Evaluating an Adaptation Strategy to Enhance Coastal Marsh Resilience*. The project was supported by the National Estuarine Research Reserve System (NERRS) Science Collaborative, which is funded by the National Oceanic and Atmospheric Administration. All Science Collaborative supported projects that collect new data adhere to federal data sharing and archiving requirements.

Data access and archival: The datasets for this project have been archived with the NERRS Centralized Data Management Office. Starting in fall 2021, datasets may be accessed via the request form at <http://www.nerrsciencecollaborative.org/resource/thin-layer-sediment-placement-data>

List of Project Datasets

Three related datasets are described in this document:

1. Thin-layer placement field data
2. Thin-layer placement sediment data
3. Thin-layer placement porewater data

About the Associated Project

Project title: Thin-Layer Sediment Placement: Evaluating an Adaptation Strategy to Enhance Coastal Marsh Resilience

Name of reserves involved in the project:

Chesapeake Bay, MD
Chesapeake Bay, VA
Elkhorn Slough, CA
Great Bay, NH
Narragansett Bay, RI
North Carolina
San Francisco Bay, CA
Waquoit Bay, MA

Project period: November 2017 to January 2020

Science Collaborative project page: www.nerrsciencecollaborative.org/project/Raposa17

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Project abstract:

Eight National Estuarine Research Reserve (NERR) sites on the U.S. Atlantic and Pacific coasts collaborated to examine the effectiveness of thin-layer placement to enhance the resilience of marshes at risk from sea level rise. Thin-layer placement (TLP) is an emergent climate adaptation strategy that mimics natural deposition processes in tidal marshes by adding a small amount of sediment on top of marsh in order to maintain elevation relative to sea level rise. It is one of the only viable strategies to protect tidal marshes in their current footprint.

The project conducted a coordinated field experiment to examine TLP across diverse estuarine conditions including various regions, plant communities, and marsh elevations. The team conducted plot-scale studies at each of the eight reserves to test the use of different thicknesses and compositions of sediment. At three reserves, the team also looked at the addition of biochar—plant-based charcoal—to improve soil and plant health. Findings thus far show the impacts of TLP vary greatly, with some commonalities. At each site, the sediment addition raised marsh elevation, increased sandiness, and affected soil conditions such as acidity, moisture, and oxygen levels. Vegetation recovered quickly at most sites. Complementary greenhouse experiments conducted by Drexel University revealed that differences in sediment can affect the outcomes of TLP. At low elevations, the goal of increasing cover in drowning marshes was achieved. Conversely, at high elevations, the objective of increasing cover by rarer, high marsh plants generally was not met. Biochar had a positive effect on vegetation at some sites, but not all, indicating a need for future research.

About the Project Datasets

1. Thin-layer placement field data

General description of data: All monitoring data collected at eight reserves for the field experiment. Broadly, this includes plot elevation, percent cover of vegetation species, canopy heights for key target species, abundance and burrow densities for crabs in plots. Data were collected from all plots and over multiple sampling dates across the entire study.

More about the data:

- The experimental design included monitoring both before and for three years after sediment addition in experimental plots and additional reference plots that served as experimental controls.
- At each of the eight reserves, field data were collected from 5 blocks of small framed plots (0.7 m x 0.7 m) for each TLP treatment in both low and high marsh. Plots were sited in marsh areas that had recently experienced sea level rise effects. In low marsh, sites were chosen to test TLP on bare areas. In high marsh, sites targeted areas where low marsh species had recently encroached and replaced rare high marsh species.
- TLP treatments included 7 cm added sediment, 14 cm added sediment, biochar sediment addition, and dredge sediment addition.

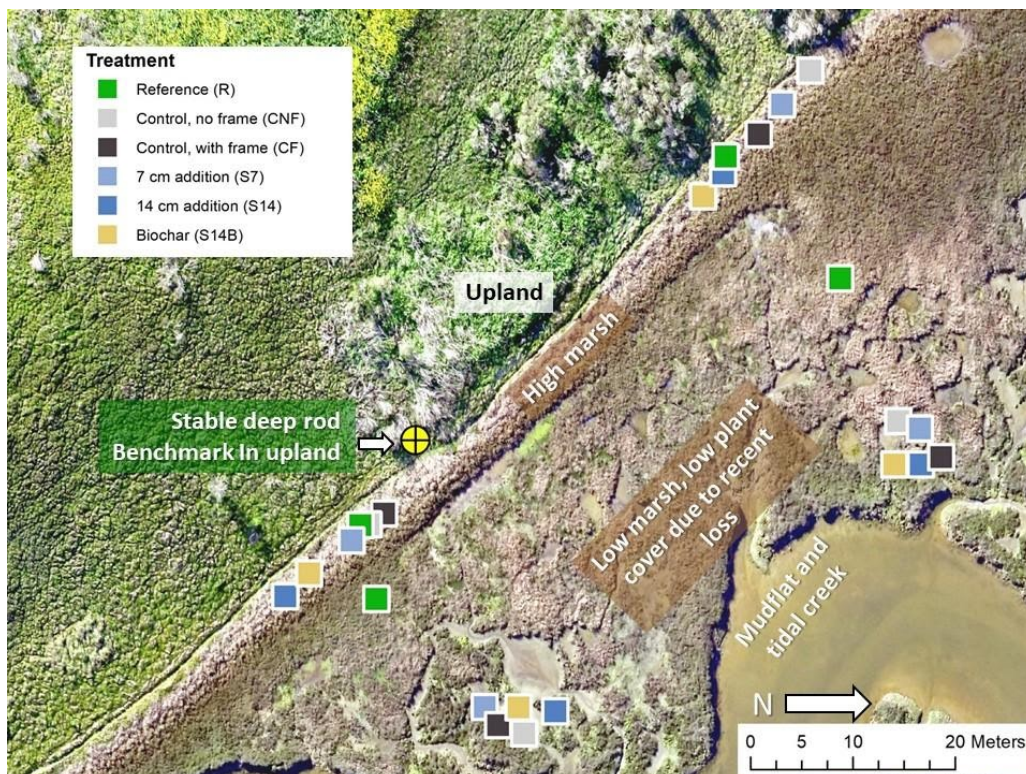
Data collection period: Spring 2018 to Fall 2020

Geographic extent: Experimental and monitoring data were collected from plots at eight reserves on the U.S. Atlantic and Pacific coasts.



File format: Excel

Maps and Schematics for Data Collection: Field data were collected at each of the eight reserves using a blocked design of small framed plots. The example below illustrates this design at from Elkhorn Slough, CA. Here two complete blocks with paired high marsh and low marsh treatments are shown. Groups of reference plots and TLP treatments were placed in the mid-marsh zone for low marsh treatments, and at the upper edge of the high marsh for high marsh treatments.



2. Thin-layer placement sediment data

General description of data: Sediment samples collected at each of the eight reserves near the beginning of the project and analyzed by Drexel University. These small samples of surface sediment were collected from different sources in or around each site, including 1) ambient (i.e. natural, unamended) marsh soils in both low and high marsh areas, 2) sediments added to the TLP plots, and 3) sediments added to various real-world TLP projects near to some reserve study sites. Broadly, sediment parameters analyzed included % water (and conversely, % dry), % organic matter, bulk density, and proportions of different grain sizes (% sand, silt, clay, and mud) along with other supplementary sediment descriptors.

More about the data:

- Samples collected from TLP plots included quarry/mud mixtures and dredge samples (biochar-amended sediment samples were not collected).

Data collection period: Fall 2017 to Spring 2019

Geographic extent: Sediment data were collected from study sites at eight reserves on the U.S. Atlantic and Pacific coasts.

File format: Excel

3. Thin-layer placement porewater data

General description of data: Porewater samples collected at each of the eight reserves during the project. Samples were collected by taking a small amount of sediment from the surface of each plot. Parameters quantified include bulk density (g cc^{-1}), % water, salinity (ppt), oxygen redox potential (ORP; mV), pH, and NH_4 (μM per gram of dry sediment). Porewater analyses were conducted by Drexel University.

More about the data:

- Samples were collected from each replicate plot in the unframed control, 7 and 14 cm sediment additions, biochar/dredge, and reference treatments. Porewater samples were not collected from the framed controls.

Data collection period: Spring 2019

Geographic extent: Porewater data were collected from study sites at eight reserves on the U.S. Atlantic and Pacific coasts.

File format: Excel