

THIN-LAYER PLACEMENT PROJECT SHEET



Waquoit Bay

October 2023

Location: Waquoit Bay National Estuarine Research Reserve

Type: Habitat restoration

Area: 34 acres

City: Falmouth

County: Barnstable

Main Agencies: Chesapeake Bay Maryland NERR, Chesapeake Bay Virginia NERR, Drexel University, Great Bay NERR, Narragansett Bay NERR, North Carolina, NERR, Roca Communications+, San Francisco NERR, Waquoit Bay NERR, Elkhorn Slough NERR

State/Province: Massachusetts

Country: United States



Taken from <https://rb.gy/ae9dd>.

Background

The Waquoit Bay National Estuarine Research Reserve (WBNERR) is located on the south shore of Cape Cod, Massachusetts. The reserve has 2,700-acres of open waters, salt and fresh marshes, sand dunes, forests, and sandplain grasslands. It is managed by the Massachusetts Department of Conservation and Recreation in partnership with the federal National Oceanic and Atmospheric Administration (NOAA). The Waquoit Bay Reserve is one of the 30 sites in the National Estuarine Research Reserve System (NERRS).

Salt marshes are coastal wetlands that are crucial for the health of fisheries, coastlines, and communities. These valuable natural infrastructures are threatened by sea level rise. Marsh resilience needs to be improved for these ecosystems to survive. A restoration strategy known as thin-layer placement (TLP) is used to mitigate the effects of erosion and sea level rise on marshes. A TLP restoration project was conducted in Sage Lot Pond, a marsh located within WBNERR. The project aimed to compare the use of TLP on low vs high marsh communities by examining the effect of sediment thickness and composition.

Project Description

Around 40-50 treatment plots were placed in high and low marsh habitats. Low marsh plots were located near the seaward elevation limit of marsh vegetation, while high marsh plots were located just seaward of the sustainable elevation for high marsh communities. Each low and high marsh habitat had five treatment plots. The types of plots used were a control plot with a frame, a control plot without a frame, a plot with 7 cm layer addition, a plot with 14 cm layer addition, and a reference plot 10-20 cm higher in elevation than the treatment plots that represented the restoration goal. The treatment plots tested the

effect of sediment thickness on the restoration of marsh vegetation. All plots were 0.7 m x 0.7 m in size, the

unframed plots were marked with PVC stakes or flags. The frames were made from untreated pine with holes drilled on the sides to allow drainage. A standard composition of 75% sand and 25% silt and clay, sourced from local quarries, was used as the sediment source. The composition aimed to imitate dredged and quarry sediments used in other local TLP projects. The reserve included a 10% addition of local mud in the sediment mixture to replicate the chemical properties of estuarine organic material. An additional treatment plot was implemented with 14 cm treatment that included a 10% by volume addition of biochar. The biochar used was Blacklite Pure, its purpose was to condition soil, increase soil cation exchange capacity, and reduce reduced soil acidity.

Findings

The project found that sediment addition was highly effective at restoring degraded salt marshes. It was found that thicker sediment layer additions were far more optimal at restoring marshes due to their higher elevation that kept pace with sea level rise. Although the 14 cm treatment plots regained vegetation at a slower pace than the 7 cm plots, after 15 months the vegetation cover was equal in both plots. Results showed that coarser sediments improved drainage and oxygenation, therefore creating a healthier marsh with a larger biomass. Additionally, the biochar addition incorporated nutrients into the sediment that enhanced soil and marsh ecosystems.

References

- Chesapeake Bay National Estuarine Research Reserve in Virginia. (2019) Mitigating Marshes Against Sea Level Rise: Thin-Layer Placement Experiment. Virginia Institute of Marine Science, William & Mary. doi: 10.25773/kqp4-0532
- Raposa, K. B. et al. (2023). Evaluating Thin-Layer Sediment Placement as a Tool for Enhancing Tidal Marsh Resilience: a Coordinated Experiment Across Eight US National Estuarine Research Reserves. *Estuaries and Coasts* (2023). <https://doi.org/10.1007/s12237-022-01161-y>

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Information on thin layer placement (TLP) case studies has been compiled as part of a DOTS/EWN project to provide a source of information, knowledge, and experience on TLP of sediment or dredged material in aquatic environments. The Thin Layer Placement Website and Map-Portal are funded by the US Army Engineer Research and Development Center (ERDC). POCs for the Thin Layer Placement Website and Map-Portal are:

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