North Carolina Reserve

October 2023

Location: North Carolina National Estuarine Research Reserve Virginia

Type: Habitat restoration

Area:

City: Wilmington

County: New Hanover

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: North Carolina

Country: United States

Taken from https://shorturl.at/qyCM3.

Background

The North Carolina National Estuarine Research Reserve (NCNERR) is the third largest estuarine system in the country. It was established to preserve the natural areas found within the reserve. Four sites represent the two major biogeographic regions located north (Virginian) and South (Carolinian) of Cape Hatteras. The Currituck Banks are in the Virginian while Rachel Carson, Masonboro Island, and Zeke's Island are located in the Carolinian region. The reserve is managed by the North Carolina Department of Environmental Quality in partnership with the federal National Oceanic and Atmospheric Administration (NOAA).

The thin-layer placement (TLP) restoration project in NCNERR focused on a component of the reserve located in its Carolinian region known as Masonboro Island. The Masonboro site is the largest undisturbed barrier island along the southern part of the North Carolina coast. It is the largest site within the NCNERR, measuring 5,653-acres. The site was after recent data showed that marsh elevation is being lost at 1.8 mm/yr at the site. Additionally, plant cover is decreasing at the lowest elevations and high marsh species are being displaced my low marsh species. The project evaluated the impact of elevation, sediment type, and layer thickness on the success of marsh restoration.

Project Description

The reserve established treatment plots in both high and low marshes that tested the effect of sediment thickness on the restoration of marsh vegetation. Two levels of sediment thickness were tested, 7 cm and 14 cm. Around 40-50 treatment plots were set up within the restoration areas.

Each plot was enclosed by a 0.7 m x 0.7 m wooden frame that helped reduce erosion, sediment slumping, and loss. Six types of plots were used: a 7 cm sediment addition with a 7 cm high containment frame, a 14 cm sediment addition with

a 14 cm high containment frame, a control plot with no frame or sediment addition, a reference plot about 10 cm higher than the others that represented the target marsh, and a 14 cm sediment addition with dredged sediment with a 14 cm high containment frame. The sediment utilized was sourced from local quarries and was a mixture of 75% sand and 25% silt and clay, to achieve an ideal texture that imitates dredged and quarry sediments utilized in other local TLP projects. An additional 10% local mud was implemented into the mixture prior to placement to replicate the composition of estuarine organic material. One of the treatment plots placed dredged sediment instead of the standard sediment mixture to examine the effects of sediment type on marsh responses to TLP. Dredged material was sourced from dredge material disposal banks adjacent to the Atlantic Intercoastal Waterway. The standard composition of dredged sediment was 50% fine sand and 50% mud.

Findings

Results showed that TLP is highly effective in raising tidal salt marshes. The treated marsh maintained its elevation, matching with sea level rise. Furthermore, the results indicated that a 14 cm sediment thickness is optimal for the restoration of marshes not only for its higher height, but also for vegetation growth. After 15 months, vegetation growth for the 14 cm thickness matched that of a 7 cm thickness where vegetation generally grows quickly, within a couple of months. Sediment size was an important factor in this experiment, it was found that coarser materials increased plant biomass. This suggests that coarser sediments improved drainage and were more oxygenated, increasing vegetation growth.

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

Myszewski, Margaret A. and Merryl Alber, 2017. *Use of Thin Layer Placement of Dredged Material for Salt Marsh Restoration.* Report prepared for the Coastal Resources Division, Georgia Department of Natural Resources by the Georgia Coastal Research Council, University of Georgia, Athens, GA, pp. 45.

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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