Masonboro Island

August 2016

Location: Masonboro Island

Type: Marsh restoration

Area: 1,800 ft^2

City: Wilmington

County: New Hanover

Agencies:

State/Province: North Carolina

Country: United States

Area of degrading marsh taken from Leonard et al. 2002

Background

Microtidal environments, such as Masonboro Island located in the southeastern coast of North Carolina rely heavily on sporadic sediment inputs during major wind-driven storm events such as hurricanes or northeaster (Croft et al. 2006, Reed 1989; Friedrichs and Perry 2001). Therefore, sediment accretion remains insufficient and is difficult to maintain an elevation in equilibrium with sea level rise. The purpose of this project was to investigate the effects of placing dredged material on the surface of a back barrier tidal salt marsh located in Masonbro Island, NC. The marshes in Masonbro Island are dissected by tidal creeks and bays that contain abundant intertidal flats and oyster bars.

Project Description

The sediment in Masonbro Island consists of approximately 50% fine sand and 50% silt and clay. The placement area experiences semidiurnal tides with a mean range of 4 ft and is strongly influenced by wind events caused by hurricanes, tropical storms and northeasters. The marsh surface was vegetated by monospecific stands of S. alterniflora, some areas had high stem densities (non-deteriorated: > 19/ft^2) whereas others had low stem densities deteriorated: < 14/ft^2) (Croft et al. 2006). Non-deteriorated sites were 9 in. higher than deteriorated sites, which means that deteriorated sites were flooded for 1.5 to 2 h longer than non-deteriorated sites (Croft 2003). For this pilot scale study, 2 non-deteriorated and 2 deteriorated sites of 450 ft^2 each received approximately 11 CY of dredged material. The material consisting of medium sized sand was homogenized prior placement. The material was placed as a wedge varying from 0 to 10 cm across each site during high tide to reduce adverse effects on vegetation, to simulate slurry disposal, and to promote uniform distribution (Leonard et al. 2002, Croft et al. 2006). The following parameters were evaluated to achieve the main purpose of this project: thin layer thickness, S. Alterniflora density, benthic community assemblage and abundance, benthic microalgal analysis and soil oxidation reduction potential (ORP) in deteriorating and non deteriorating marsh sites. Most of these parameters were measured every other month for approximately a year, except for benthic infaunal samples which were collected 2 weeks pre-placement, and 6 weeks and 1 year post-placement. Also, the optimal sediment thickness required to improve the deteriorated sites without causing negative impacts to the non-deteriorated sites was determined. Sediment cores were collected after placement to determine the thin layer thickness. Sediment characteristics such as organic content, dry bulk density and grain size distribution were measured on an annual basis. Statistical analysis was performed to analyze the collected data,

Findings

Stem densities increased after thin layer placement in both the non-deteriorated (from 256 g/m^2 to 336 g/m^2) and the deteriorated (from 149 g/m^2 to 308 g/m^2) sites. Thin layer placement resulted in an increase in the ORP, the thicker the layer the higher the ORP. Prior placement, mean deposition rates and organic content were higher in the non-deteriorated sites. Post-placement, deposition rates and organic content were approximately the same in the deteriorated and non-deteriorated sites which means that deteriorated sites became more stabilized over time (Croft 2003). The grain size of surficial sediments has decreased which means that the thin layer of sand has taken sedimentological attributes of the marsh prior placement. The results of this project show that thin layer placement has a greater impact on deteriorated sites as compared to non-deteriorated sites; therefore, thin layer placement may be used to mitigate effects of degrading marshes without affecting non-deteriorated areas.

References

Croft, A.L. (2003) The Effects of Thin Layer Dredged Material Disposal on Tidal Marsh Processes, Masonboro Island, NC. Thesis, University of North Carolina at Wilmington, Department of Earth Sciences.

Croft, A.L.; Leonard, L.A.; Alphin, T.D.; Cahoon, L.B.; Posey, M.B. (2006) The Effects of Thin Layer Sand Renourishment on Tidal Marsh Processes: Masonboro Island, North Carolina. Estuaries and Coasts. Vol. 29, No. 5, P. 737-750.

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Points of Contact

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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