Restoration Trajectories in Created Tidal Marsh Habitat – A Case Study from Poplar Island, MD USA

Lorie W. Staver[1]*, Jeffrey C. Cornwell*[1]*, Elizabeth Murray*[2]*, Safra Altman*[3]*, Abigail Eilar*[4]

[1]University of Maryland Center for Environmental Science, Horn Point Laboratory, Cambridge, MD USA
[2]U. S. Army Corps of Engineers, San Francisco District, San Francisco, CA, USA
[3] U. S. Army Engineer Research and Development Center, Vicksburg, MS, USA
[4] Oak Ridge Institute for Science and Education, U.S. Department of Energy

Tidal marsh loss in coastal areas of the U. S. has inspired a variety of approaches to restore habitat and associated ecosystem services, such as protection from flooding and shoreline erosion, nutrient cycling and carbon sequestration. Increasingly, material dredged during navigation channel maintenance is beneficially used to supplement declining marshes or create new marshes. We present results from a large-scale marsh creation project where fine-grained dredged material is used to create 314 hectares of tidal marsh habitat in mid-Chesapeake Bay, MD, USA. In contrast to marsh projects where sand is the substrate, the Poplar Island marshes are nutrient rich, leading to the hypothesis that vegetation development trajectories could also be quite different. We analyzed vegetation development in eight created marshes ranging in age from 3-16 years, seven with the high-nutrient substrate and one with low-nutrient sand, with the goal of characterizing trajectories to help inform future, similar projects. Additionally, trajectories using different vegetation monitoring methodologies were compared to offer insights for future marsh monitoring designs and suggest where cost savings might be possible.

We found that fine-grained dredged material enhances vegetation development, as reflected in aboveground biomass production, percent cover and canopy height, exceeding biomass and canopy height reported for many natural marshes for the first few years after establishment. There is, however, high variability, driven in part by *Spartina alterniflora* dieback, which frequently occurs within the first five years post-planting. Long-term monitoring shows that the marshes, including those recovering from dieback, trend toward biomass production levels more similar to natural marshes. Declining nitrogen availability is likely at least partially responsible for the observed trend in biomass production. In contrast, the low nutrient marsh shows a more gradual increase in aboveground biomass production and appears less subject to dieback. Similar trends were observed in canopy height and percent cover.

Contact Information: Lorie Staver, University of Maryland Center for Environmental Science, Horn Point Laboratory, 2020 Horn's Point Road, Cambridge, MD, USA 21613, Phone: 410-221-8446, Email: lstaver@umces.edu