Questions of Sustainability in a Large-scale Tidal Wetland Restoration in Chesapeake Bay

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As part of the Poplar Island Environmental Restoration Project there is a plan to create approximately 300 hectares of tidal marsh, primarily using material dredged from shipping channels in upper Chesapeake Bay. Unlike the sandy material used in many coastal marsh restoration projects, this material is fine-grained and high in nutrients. Of the first two wetlands completed, one was constructed with the upper Bay material (Cell 3D, planted in 2005), the other with local sand (Cell 4D, planted in 2002). Vegetation and sediment monitoring efforts have revealed striking differences between the two *Spartina alterniflora* marshes, including sparser vegetation and higher recruitment of new plant species in Cell 4D, and lodging, intense muskrat grazing, leaf freckling and high rates of fungal infection in Cell 3D. Biomass production and allocation also differ markedly between these two cells with higher belowground biomass and root:shoot ratios in Cell 4D and much higher aboveground biomass in Cell 3D. Furthermore, extensive die-backs have occurred in Cell 3D but not in Cell 4D.

We hypothesize that the observed differences, including biomass allocation, are due to differences in nutrient content of the upper Bay material vs. sand. Preliminary sediment accretion measurements indicate that the impact of diebacks and low root:shoot ratios is negative, and since external inorganic sediment inputs will be limited in this system by design, belowground production is especially important for vertical accretion. Local sea-level rise is currently 3.2 mm y^{-1} in Chesapeake Bay and expected to at least double over the next century. Given the goal of creating self-sustaining marshes, healthy vegetation leading to adequate vertical accretion in essential. Currently, we are exploring the potential benefits of soil amendments to overcome the effects of high sediment nutrient concentrations on *S. alterniflora*.

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