Sediment Enhancement and Hydrological Restoration Impacts on Salt Marsh Vegetation and Soils in Coastal New England

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Introduction:

Objective
Assess the progress and monitor the soil/vegetation response of two types of salt marsh restoration projects Rhode Island: hydrological and sediment enhancement

Salt Marsh Restoration to Combat Sea Level Rise
Hydrological Restoration occurred in 2016 and was accomplished through dredging runnels into the salt marsh platform. This allows for excess water to drain from the marsh surface, which is expected to promote vegetation growth. In this study, soft sediment runnels are runnels surrounded by unstable sediment and are semi-vegetated. Vegetated runnel are runnels surrounded by vegetation.

Sediment Enhancement is the addition of dredged sediment to the marsh platform to raise its elevation. This project occurred in 2016 and was accompanied by salt marsh planting efforts, since the previous vegetation was buried after sediment placement.

Methods and Materials:

Four Treatments:
1. Control (No restoration)
2. Sediment Enhancement
3. Soft Sediment Runnels
4. Vegetated Runnels

Sampling
1. Occurred in October 2018
2. Measured Spartina alterniflora stem density and Spartina patens percent cover of twelve plots (26cm diameter) per treatment.
3. Collected 12 soil cores (5cm diameter/height) per restoration treatment

Soil Core Processing:
1. Dry sample (30°C)
2. Sieve (2mm)
3. Weigh belowground biomass
4. Burn sieve contents at 400°C
5. Weigh mass after burn for percent organic matter
6. Analyze with ANOVAs and regression analyses

Acknowledgements:
We would like to thank Max Zevul, Maria Sharkey, Michaela Smith, and Brielle Michener for help with data collection. We would also like to thank Wesley Ferguson and Dr. Kathleen Wiegard for experimental design guidance. Also, a thank you to the University of Rhode Island and NSF GRFP for funding and U.S. Fish and Wildlife Service (USFWS) for granting permits to complete this research. Hydrological restoration and sediment enhancement were conducted by USFWS.

Results:

All treatments contained less belowground biomass than control

Sediment Enhancement and Vegetated Runnel contained less organic matter than control

Vegetated Runnel contained less S. alterniflora, but more of the high marsh plant S. patens.

Significant relationship between belowground biomass and organic matter

Discussion/Conclusion:

• Although the Vegetated Runnel cores contained less belowground biomass than the control, the predominate plant was S. patens, which contains finer roots than S. alterniflora.
• Vegetated Runnel cores contained less organic matter than the control, which could be explained by the finer roots of S. patens.
• Sediment Enhancement treatment showed low vegetation coverage, which is correlated with little belowground biomass and organic matter.
• There is a relationship between belowground biomass and organic matter, where belowground biomass is potentially influencing organic matter production.

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Future Work:

• Investigate other soil parameters of the sediment enhancement and runnel treatments.
  - % Moisture, sulfate concentrations, bulk density
• Measure vegetation growth response of different sediment types, which can be applied to sediment enhancement research

References: