Eelgrass Sediment Characteristics in the South Slough Estuary, OR

Reagan Thomas[1] and Alicia Helms[2]

[1]Portland State University
[2]South Slough National Estuarine Research Reserve

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Abstract

Seagrasses provide a variety of ecosystem services, including sediment stabilization, sediment accretion, improving water quality through trapping suspended sediments, and storing carbon and nutrients. Sharp declines in eelgrass (Zostera marina) abundance at South Slough have prompted efforts to understand eelgrass stressors in the estuary. Sediment characteristics including organic matter, carbon content, grain size distribution, bulk density, and porosity were investigated along with eelgrass metrics at several sites along the estuarine salinity gradient. These data were used to study the sediment characteristics of intertidal eelgrass beds in the South Slough estuary, how characteristics vary between sites along the salinity gradient, and to determine the relationship of sediment characteristics and eelgrass abundance. Results show that eelgrass was present at sites characterized by high percent sand and low percent silt/clay, low porosity and high bulk density, and low organic matter and carbon content. Eelgrass was absent from sites characterized by low percent sand and high percent silt/clay, high porosity and low bulk density, and high organic matter and carbon content. These results suggest that fine sediment may be one stressor contributing to changes in intertidal eelgrass distribution in the South Slough estuary. This study can help inform eelgrass restoration efforts in South Slough, especially regarding habitat suitability and site selection.

Eelgrass Sediment Characteristics in South Slough Estuary, Oregon

Reagan Thomas and Ali Helms (Summer 2021)
Oregon Institute of Marine Biology P.O. Box 5389 Charleston, OR 97420

Eelgrass

Eelgrass (*Zostera marina*) provides many ecosystem services that support diverse habitats within the South Slough estuary. Recent declines in abundance have prompted efforts to understand eelgrass stressors in the estuary. One of the key components of eelgrass habitat is the sediment in which they grow. Understanding how sediment characteristics relate to eelgrass helps inform habitat suitability for eelgrass restoration.

Research Questions

1. **What are the sediment characteristics of intertidal eelgrass beds in the South Slough estuary and how do they vary between sites along the salinity gradient?**
2. **What is the relationship between eelgrass abundance and sediment characteristics?**

Methods

Eelgrass surveys: Eelgrass metrics sampled in 0.25 m² quadrats were % cover, shoot density, and number of flowering shoots.

Grain Size Analysis: Samples were sieved with a Ro-tap shaker into size classes from >2mm–<63um.

Bulk Density: dry weight/volume

Porosity: ((wet weight – dry weight)/volume)*100

% Organic Matter: The loss on ignition (LOI) method was used to burn off organic matter from sediment samples: (mass lost)/initial mass *100

% Carbon Content: (0.43 * %LOI) – 0.33 (Fourqurean et al. 2014)

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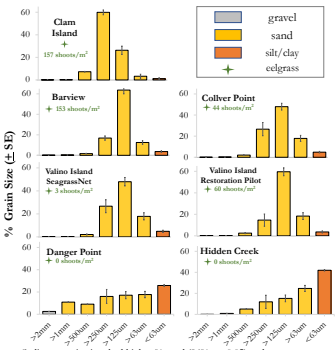
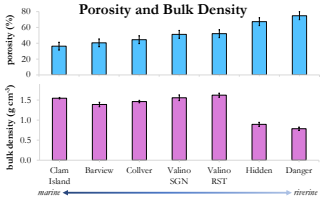
Results: Grain Size



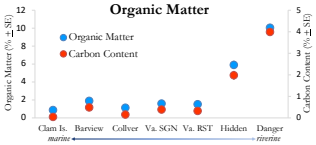
Sediment grain sizes had higher % sand (96%, $p<0.05$) and were coarser at marine and mid estuarine sites (Clam Is., Barview, Collver Pt., and Valino Is.) than riverine sites (Hidden Cr. and Danger Pt.). Marine sites had lower % silt/clay (3%). In contrast, riverine sites had higher % silt/clay (34%, $p<0.05$) and finer sands at riverine sites (64%).

Porosity and Bulk Density



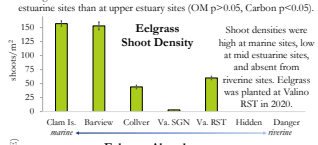
Porosity increases and bulk density decreases from marine to riverine sites. Higher porosity and lower bulk density were correlated with finer silt/clay.

Organic Matter



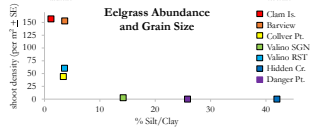
Organic matter and carbon content were lower at marine and mid estuarine sites than at upper estuary sites (OM $p>0.05$, Carbon $p<0.05$).

Eelgrass Shoot Density



Shoot densities were high at marine sites, low at mid estuarine sites, and absent from riverine sites. Eelgrass was planted at Valino RST in 2020.

Eelgrass Abundance and Grain Size



Eelgrass abundance was higher at marine sites with sandier sediment and lower % silt/clay. Eelgrass was absent from sites (Hidden Cr. and Danger Pt.) with higher % fine sediment and lower % sand.

Discussion

Eelgrass was present at sites characterized by high % sand and low % silt/clay, low porosity and high bulk density, and low organic matter and carbon content. Eelgrass was absent from sites with low % sand and high % silt/clay, high porosity and low bulk density, and high organic matter and carbon content. Eelgrass abundance was higher at Valino RST than SGN due to planting in 2020 for the Reserve's pilot restoration project.

Fine sediment has been shown to be a significant stressor on eelgrass meadows; however, eelgrass can occur in silt/clay sediments ranging from 13-70%, with lower thresholds for replanting (Zabarte-Maeztu et al 2020). **Sediment characteristics and interactions with other abiotic stressors (e.g., temperature, salinity) are important to consider for habitat suitability to increase restoration success**.

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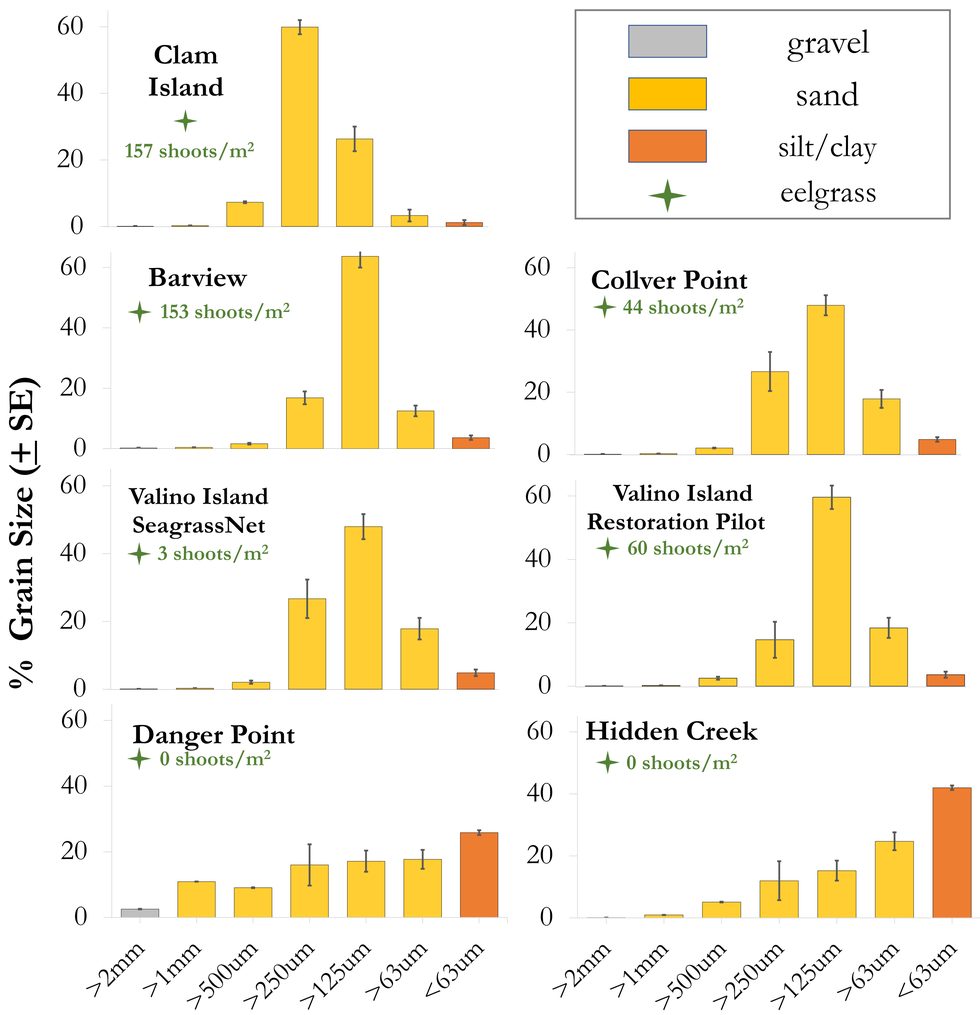

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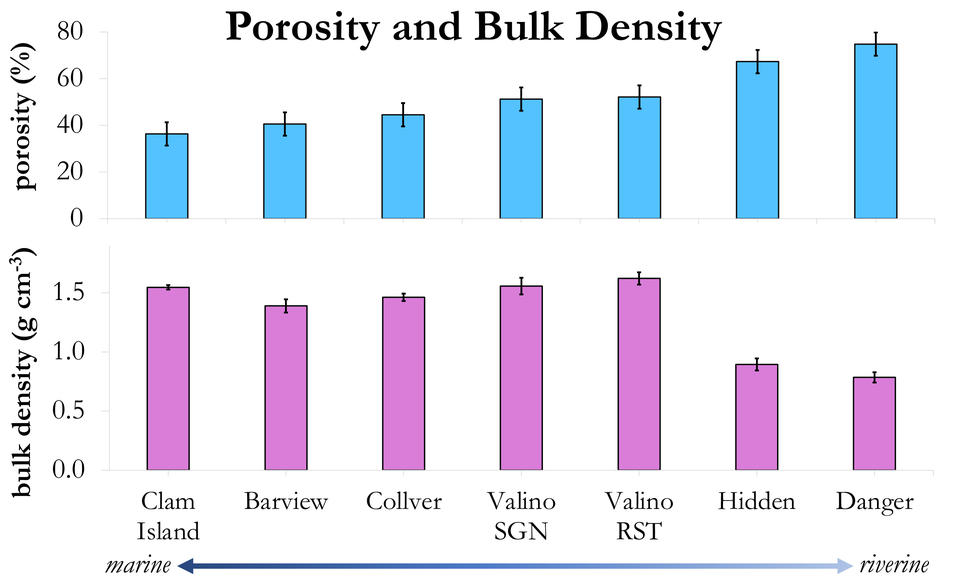

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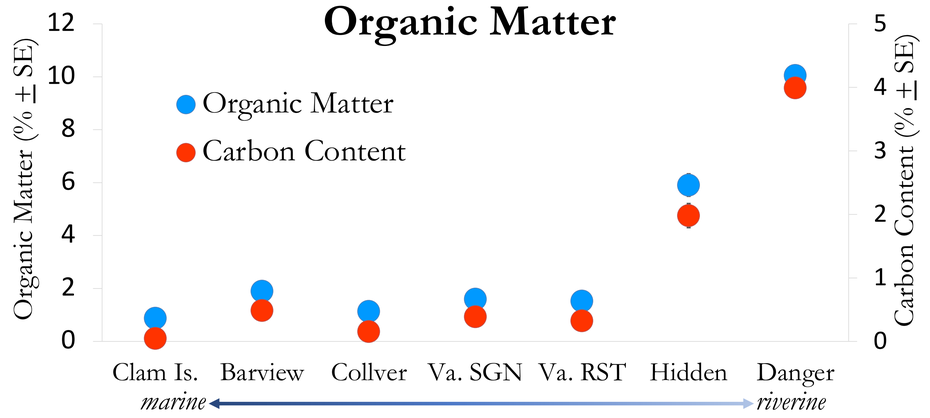

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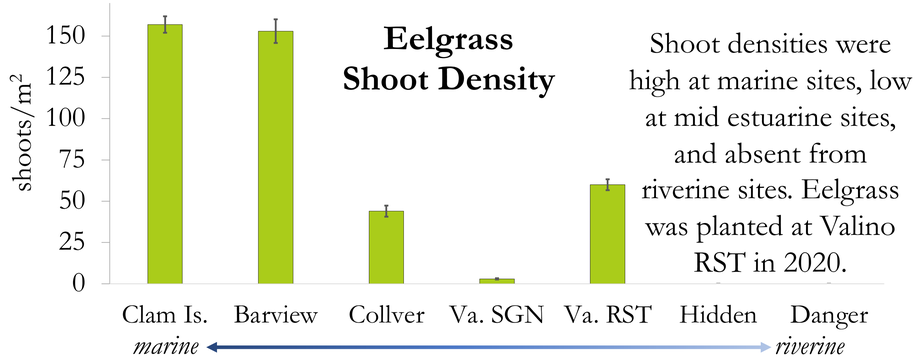

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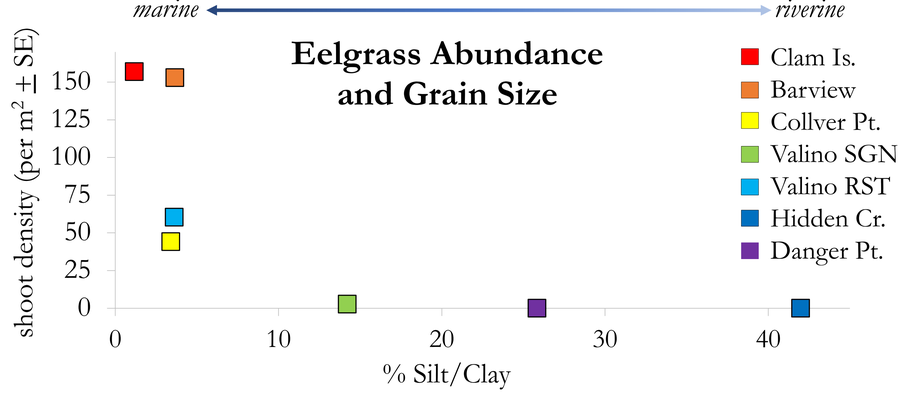

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