Soil property shifts with marsh migration into natural and created upland islands

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Marshes on the move

Salt marshes are under threat from climate change, especially sea-level rise.

Adjacent upland habitat can act as lateral migration space for marshes if it is left undeveloped.

Wetland restoration, such as that using dredge sediment, can also create lateral migration space.

It is currently unclear if the process and outcome of lateral marsh migration is equivalent between natural islands and created dredge spoil islands.

To address this gap, we are using coring techniques in natural and created islands to compare the ecological shift in soil properties with marsh migration.

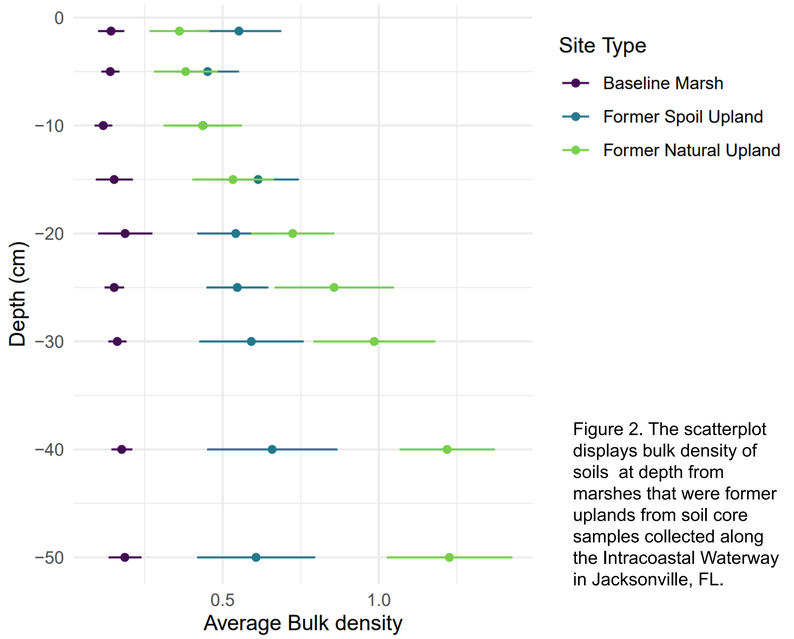
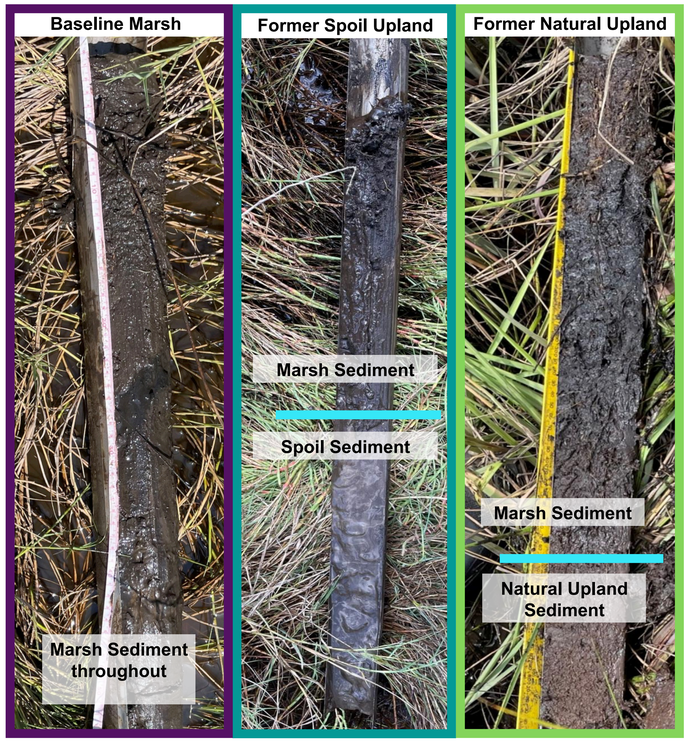


Figure 2. The scatterplot displays bulk density of soils at depth from marshes that were former uplands from soil core samples collected along the Intracoastal Waterway in Jacksonville, FL.



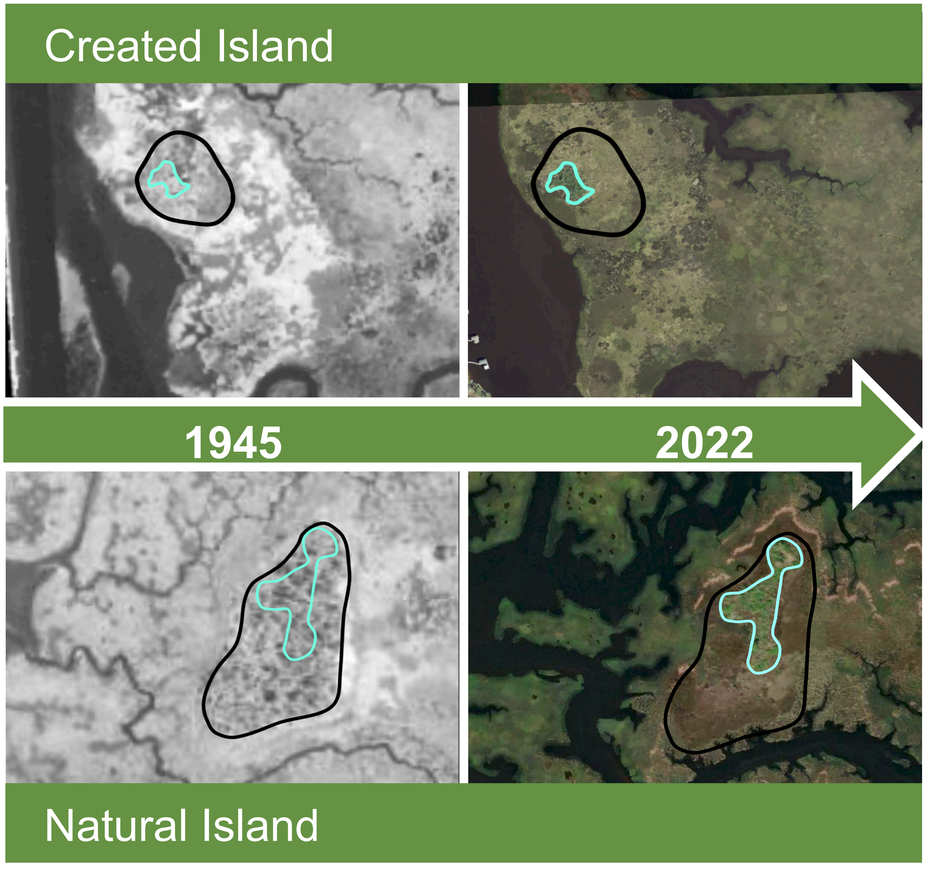


Figure 1. Pictures show marsh migration into upland habitat at a created island (formed from sediment excavated from the Intracoastal Waterway via dredge) and a natural island, both located in the UNF William C. Webb Coastal Research Station in Jacksonville, FL. Black line represents approximate upland habitat boundaries from the 1940's, and light blue line represents approximate upland habitat boundaries from the 2020's.

Spoil Islands create equivalent marsh migration corridors to natural uplands

Newly converted marshes are not equivalent to baseline marshes

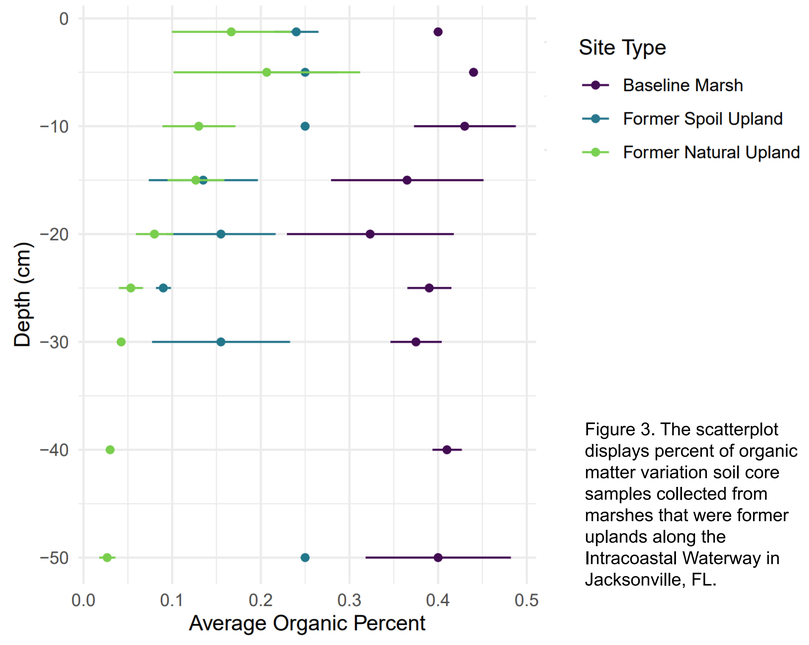


Figure 3. The scatterplot displays percent of organic matter variation soil core samples collected from marshes that were former uplands along the Intracoastal Waterway in Jacksonville, FL.

Discussion

Created uplands using spoil material and natural uplands exhibit similar properties within the first 10 cm of soil. If at similar elevations with similar hydrology, restoration efforts may be able to use spoil materials to create comparable migration corridors for marshes to keep pace with sea-level rise.

Neither spoil nor natural sites are equivalent in soil properties to baseline marshes, even at the surface where marsh vegetation and hydrology is present. This could be due to differences in average elevation and inundation (baseline marshes are lower than newly converted marshes).

In the future, imagery will be used to estimate dates associated with the transition from upland to marsh and compared to depths of organic matter. This will be used to estimate accumulation rates; with additional funding, soil cores will be dated using Pb^{210} isotopes.

Ultimately, this research informs the efficacy of restoring wetlands using dredge material, and the long-term resilience of created wetlands to sea-level rise.

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