



# Framework for Implementing Sustainable Shorelines

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## Summary of Natural Science Investigations: Marsh Vegetation

## Project Activity: Marsh Function Model: marsh plant productivity in living shorelines

**Objective:** Comparatively evaluate marsh plant abundance and biomass within living shorelines and reference marshes along a continuum of shorescape settings.

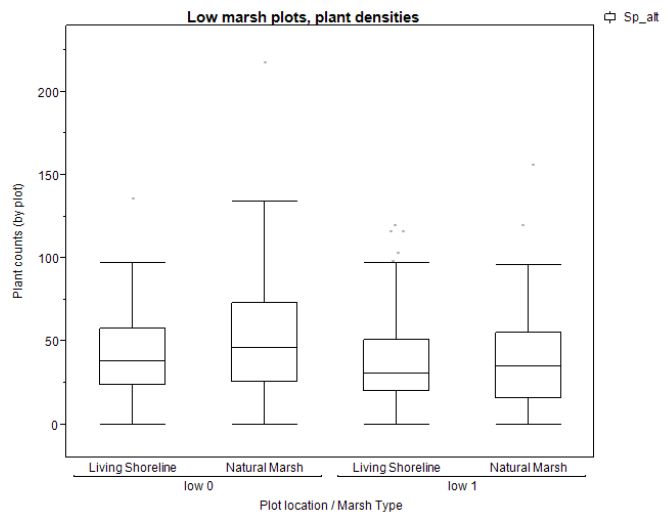
**Methods:** During 2018, we surveyed low and high marsh vegetation, within 13 paired living shoreline and reference marshes in the lower Chesapeake Bay. Surveys consisted of establishing 6 transects perpendicular to the aquatic edge of the marsh. In each transect, 0.25 m<sup>2</sup> quadrats were placed at the low marsh aquatic edge and 1 m inland from the aquatic edge. Within each quadrat, for each species, the number of plant stems were counted and average height determined.

**Results:** Although there were 12 species identified over plots in all marshes, only *Spartina alterniflora* (in the low marsh) and *Spartina patens* (in the high marsh) appeared in quantities high enough to be analyzed across living shorelines. *Distichlis spicata* was an important community member in natural, high marsh plots.

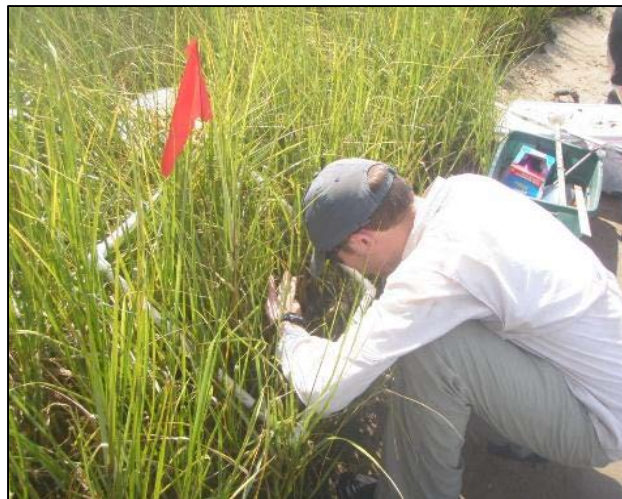
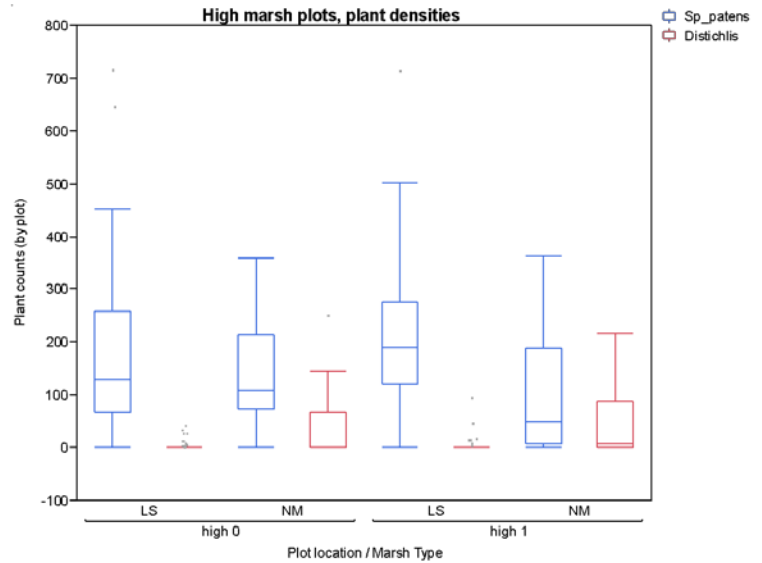
*Spartina alterniflora* density was slightly higher in the low marsh than the high marsh, but counts didn't differ significantly. There were also no significant differences between plant counts in the low marsh of Living Shorelines and Natural Marshes (P=0.3). *Spartina alterniflora* biomass was calculated using the formula  $S. alterniflora$

$Biomass = (0.1807e^{(0.0332 * Mean HT)}) * Number\ of\ Stems$  (Beck et al. 2017). There were also no significant differences between plant biomass in the low marsh of Living Shorelines and Natural Marshes (P=0.18). *S.*

*alterniflora* was not correlated with marsh age; therefore, it cannot be assumed that as a marsh matures, plants will become denser.



*Spartina patens* density was significantly higher in the Living Shorelines than Natural Marshes ( $P=0.03$ ), while *D. spicata* was significantly higher in Natural Marshes than Living Shorelines ( $P<0.0001$ ). These differences simply reflect the fact that Living Shorelines were not planted with *D. spicata*, so its presence was rare in those systems, but it was approximately 1/4- 1/3 of the plant population in Natural Marshes. When the densities of the two plants species were combined into a “high marsh” community, there was no statistical difference ( $P=0.4$ ) between plant density in Living shoreline and Natural Marsh high marshes.



## Publications

Bilkovic, D.M., R. Isdell, A. Guthrie, M. Mitchell. 2021. Ribbed mussel *Geukensia demissa* population response to living shoreline design and ecosystem development. *Ecosphere* 12: e03402 <https://doi.org/10.1002/ecs2.3402>

Isdell, R. E., D.M. Bilkovic, A. Guthrie, M.M. Mitchell, R. Chambers, M. Leu, and C. Hershner. 2021. Living Shorelines Achieve Functional Equivalence to Natural Fringe Marshes across Multiple Ecological Metrics. *PeerJ* 9:e11815 <http://doi.org/10.7717/peerj.11815>