

Introduction

Living shorelines are **Nature Based Solutions**, that use plants, sand, and rocks to protect coastlines from erosion while providing ecological functionality. The West Pond Living Shoreline Restoration Project, completed in 2021, is being monitored to inform adaptive management and provide lesson learned for future projects. In 2023, data was collected on the characteristics of planted *Spartina alterniflora*, a keystone marsh grass in determining shoreline health.



Figure 1. Map of Jamaica Bay, NY. West Pond Living Shoreline circled in yellow as indicated above.

Our aims were to compare elevation, percent cover, stem height, and stem density of *Spartina alterniflora* from 2023 to 2024 to determine if the shoreline is stable and growing and to determine if sediment characteristics were indicative of erosion and deposition of sediment at the living shoreline.

Methods

Data collected and remeasured from 8 randomly distributed points selected in 2023 within 12 cells along West Pond Living Shoreline. **Fig. 2.**

- The 15 tallest stem heights were measured in a 1m² quadrat. **Fig. 3.**
- Percent cover was measured using point intercept method using a gridded 1-m² quadrat.
- Stem density was measured by counting all stems within a 0.25-m² quadrat.
- Elevation for each sampling point was measured with a Trimble RTK Global Positioning system. **Fig. 4.**
- Extracted sediment from the 8 1-m² quadrats within each cell.
- Sediment grain sizes determined by dry sieving 10-cm deep sediment samples collected from each point. **Fig. 5.**

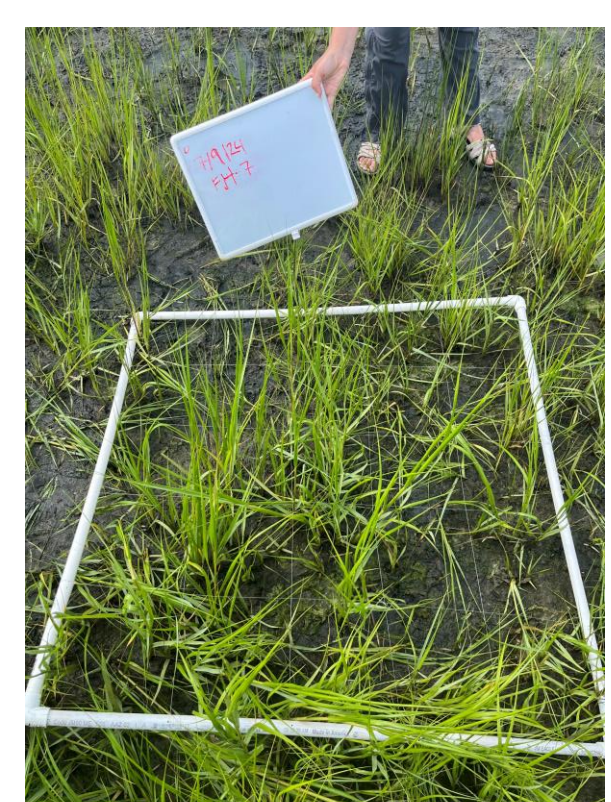


Figure 2



Figure 3



Figure 4



Figure 5

Methods



Figure 6: All initially established cell locations labeled from west to east from 2023. "L" cells correspond to lower elevation, "H" cells correspond to higher elevation.

Results 1

Significant variation between stem height, stem density and percent cover across cells from 2023 and 2024 measurements. Statistical significance between 2023 data and 2024 data determined by t-Test: Paired Two Sample for Means.

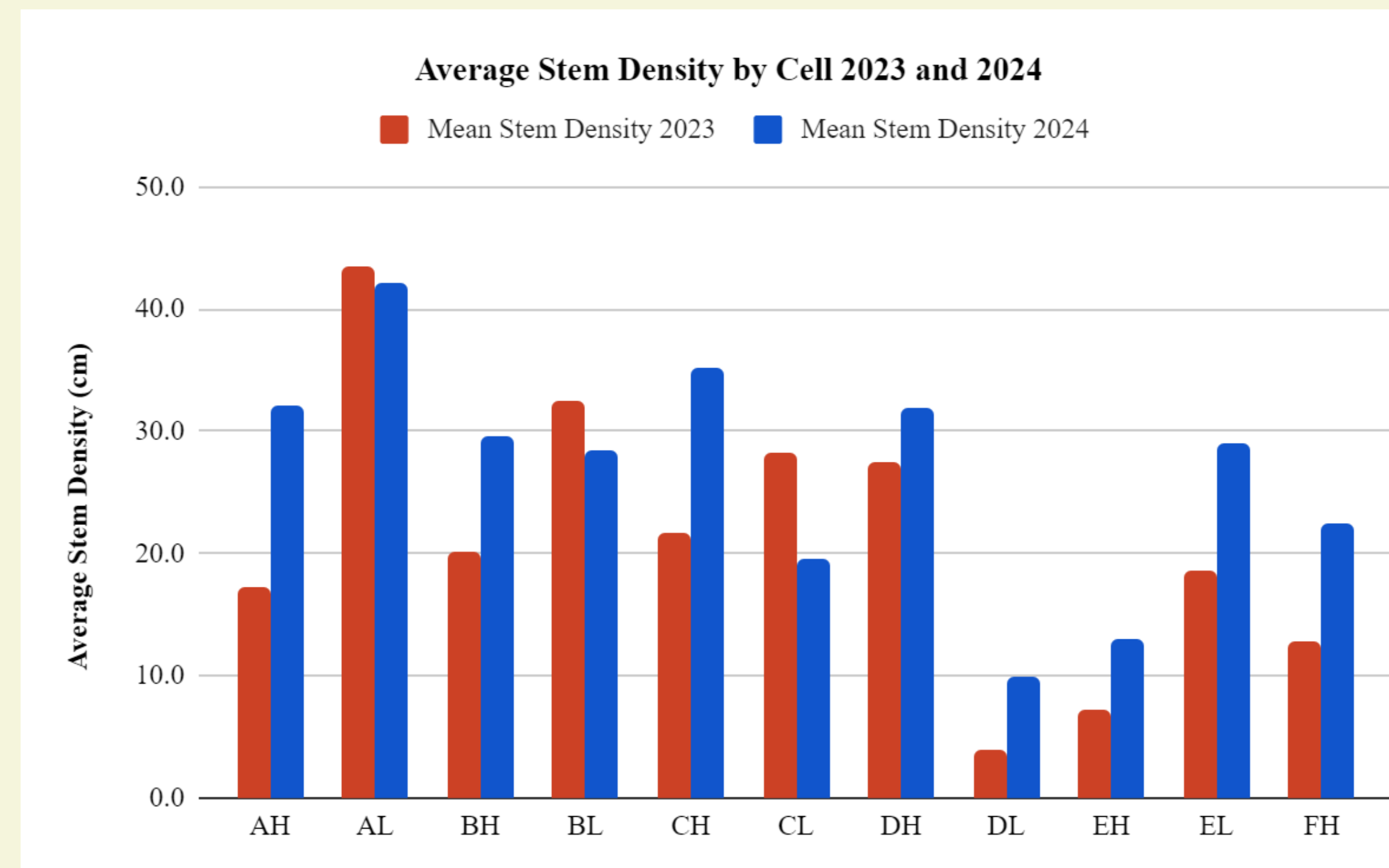


Figure 7: Average stem density of *Spartina alterniflora* in 2023 and 2024. Density increased in all cells except AL, BL, and CL. Cells with a significant difference in stem density between 2023 and 2024 are AH and EH ($p < 0.05$).

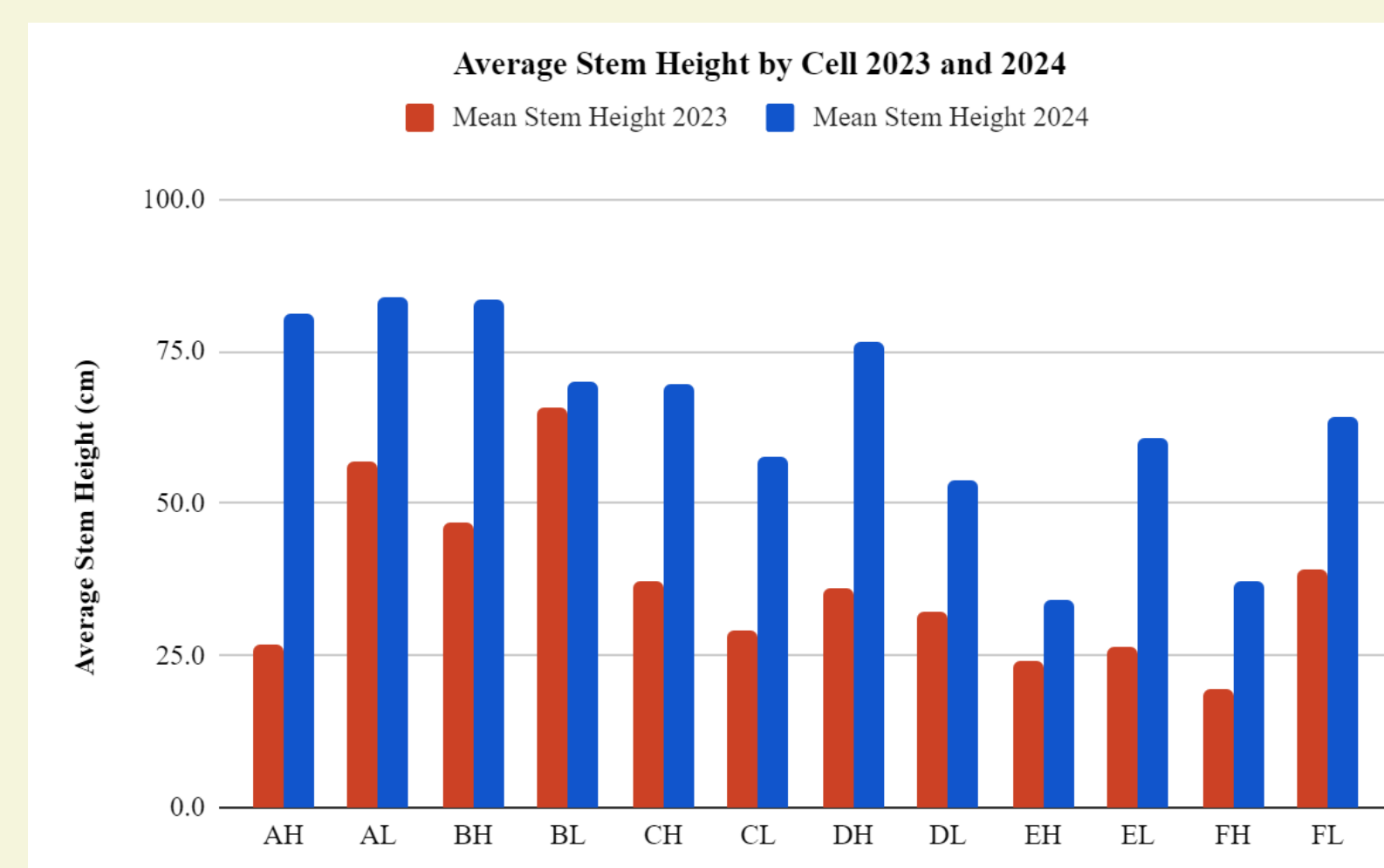


Figure 8: Average stem heights of *S. alterniflora* in cells from 2023 and 2024. Stem height increased in all cells. All cells show a significant difference in stem heights between 2023 and 2024 ($p < 0.05$) except BL and DL.

Note: Stem heights were measured in a 0.25-m² quadrat in 2023 and a 1-m² quadrat in 2024. However, the increase in stem heights across all cells is not likely to be an artifact of changing the quadrat size.

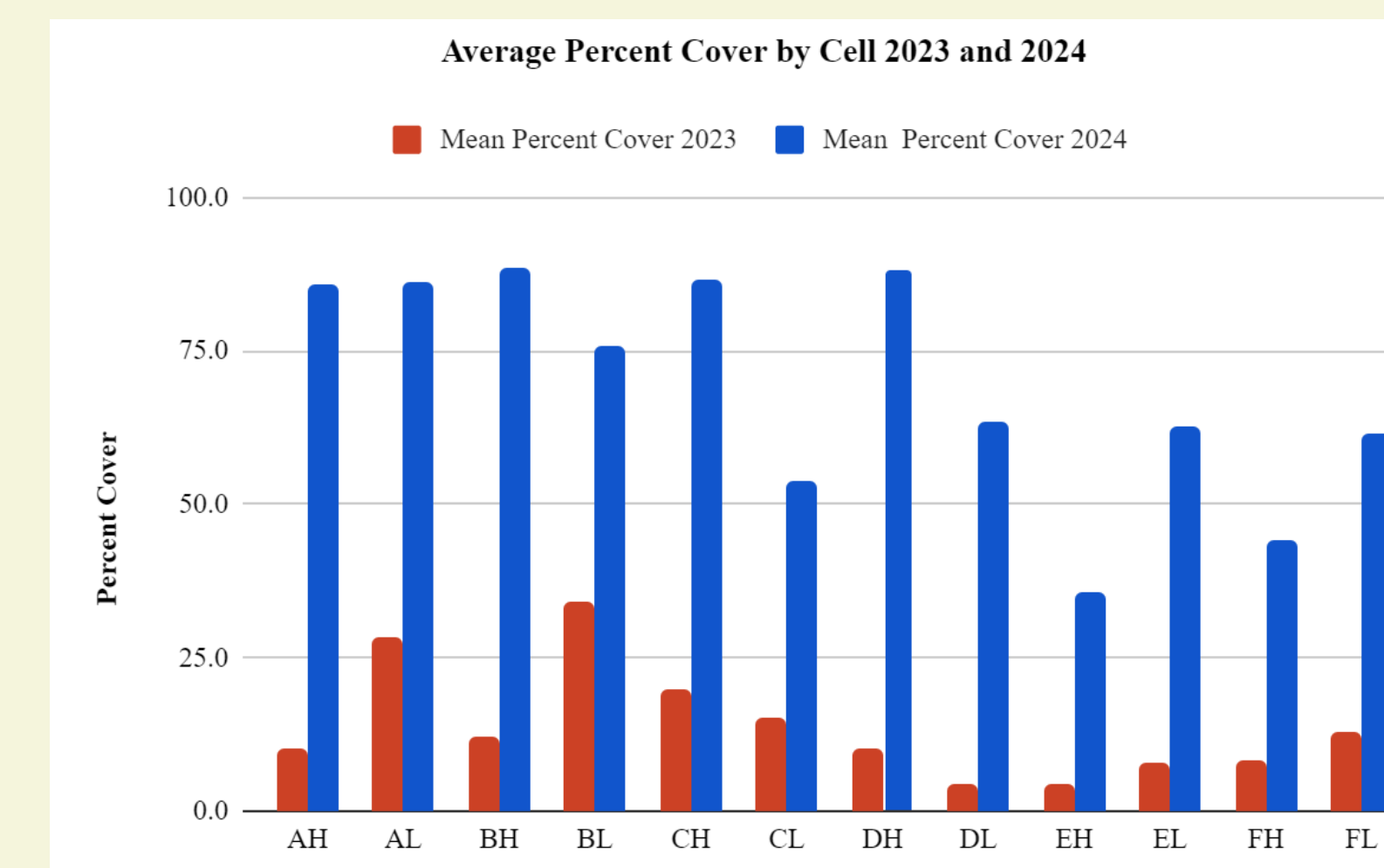


Figure 9: Average percent coverage of *S. alterniflora* in cells from 2023 and 2024. Percent cover increased in all cells. All cells show a significant difference in percent cover from 2023 to 2024 ($p < 0.05$) except DL.

Results 2

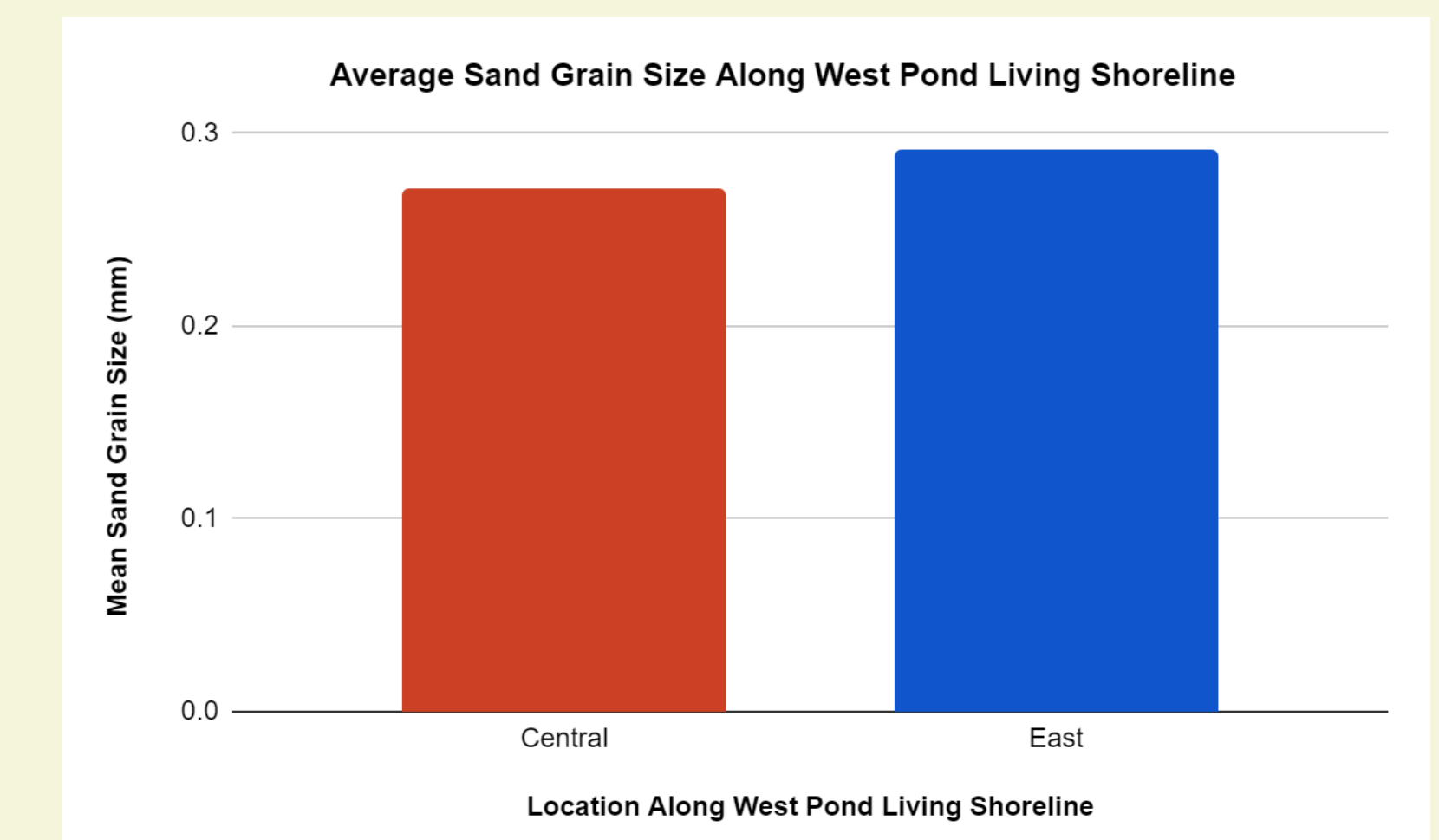


Figure 10. Average sand grain size along West Pond Living Shoreline. Larger grain sizes observed in eastern end of West Pond Living Shoreline.

Results 3

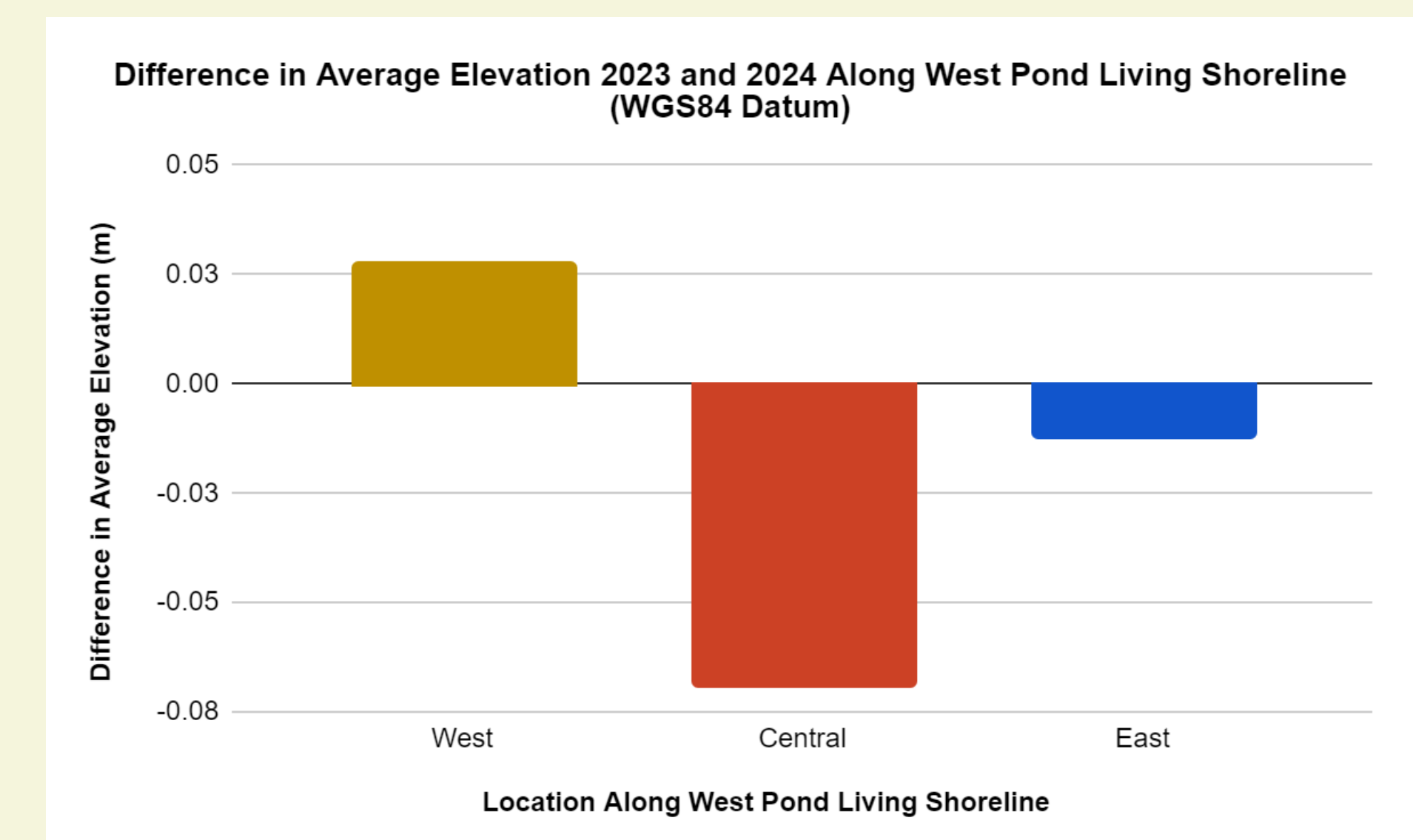


Figure 11. Difference in average elevation (m) from 2023 to 2024 along the West Pond Living Shoreline. Elevation is the difference between the mean of the 32 measuring points at each section of the beach. The central section of the West Pond Living shoreline has decreased in elevation from 2023 to 2024.

Discussion

- *Spartina alterniflora* growth has increased from 2023 to 2024. Plants are surviving and spreading across the shoreline, indicating that adaptive management has been successful (Fig. 7, 8, 9).
- Elevation differences from 2023 to 2024 may indicate that there is no net loss of sediment across the shoreline, but sediment may be drifting from east to west.
- There is no difference in sediment grain size between the central and east sections, but we hypothesize that the west will be finer sand indicating deposition.
- Without the grain sizes from the west end, we are not able to fully determine if grain size is correlated with elevation gain or loss. These results are pending.

Acknowledgments & References

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- References**
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