

Identifying impacts of sea level rise on coastal archaeological sites, a project of the Southeast Florida Regional Climate Compact

Alanna Lecher¹ and April Watson¹

¹Lynn University

November 26, 2022

Abstract

The Southeast Florida Regional Climate Compact is a collaboration across Broward, Miami-Dade, Monroe, and Palm Beach counties to stimulate sustainability and climate resilience across the counties. Efforts within the Regional Climate Action Plan, a product of the compact, include prevention, mitigation, and monitoring of climate change impacts to natural and cultural resources. In Palm Beach County, one such effort has been the monitoring of coastal archaeological sites vulnerable to sea level rise. The monitoring efforts include identification of coastal archaeological sites, precise mapping of site locations, excavation of the sites to determine the presence of artifacts and/or human remains, and geoarchaeological methods to assess how the site may be impacted by sea level rise. Preliminary results from sites within the region indicate that buried archaeological sites will experience sea level rise impacts earlier than expected as increased groundwater levels, in part caused by rising sea level, will expose the sites to damp and saturated conditions before the sites are over-topped by increased sea level. Increased moisture within the sediment that the sites are entrained in can lead to damage to the artifacts, especially in midden sites, which are mainly composed of faunal remains. Based on these findings, new methods determining risk level of coastal archaeological sites in South Florida are needed.

Identifying Impacts of Sea Level Rise on Coastal Archeological Sites, a Project of the Southeast Florida Regional Climate Compact



Alanna L. Lecher* & April Watson

Natural and Applied Sciences, Lynn University, Boca Raton, FL, *alecher@lynn.edu

1. Southeast Florida Regional Climate Compact

- Agreement across 4 counties on the southeastern peninsula of Florida
- The goal is to coordinate efforts to mitigate and adapt to climate change
- Addresses environmental, social, and economic disruptions
- Check out southeastfloridacclimatecompact.org for more info!



2. Archeology in South Florida

- Native American archeological sites are ubiquitous in South Florida
- Site ages typically exceed 1,000 years, but can exceed 4,000
- Most sites are comprised of mounds (man-made dirt piles) or middens (trash heaps)
- Human remains are present at most sites (Figure 2)
- Some ancient burial sites are already submerged under the sea, e.g. Manasota Key (7,000 yr old) is now 100 ft from shore¹
- The Palm Beach County is currently working to prioritize sites for preservation under various sea level rise scenarios
- Rapid wetting of sites causes artifact destruction²

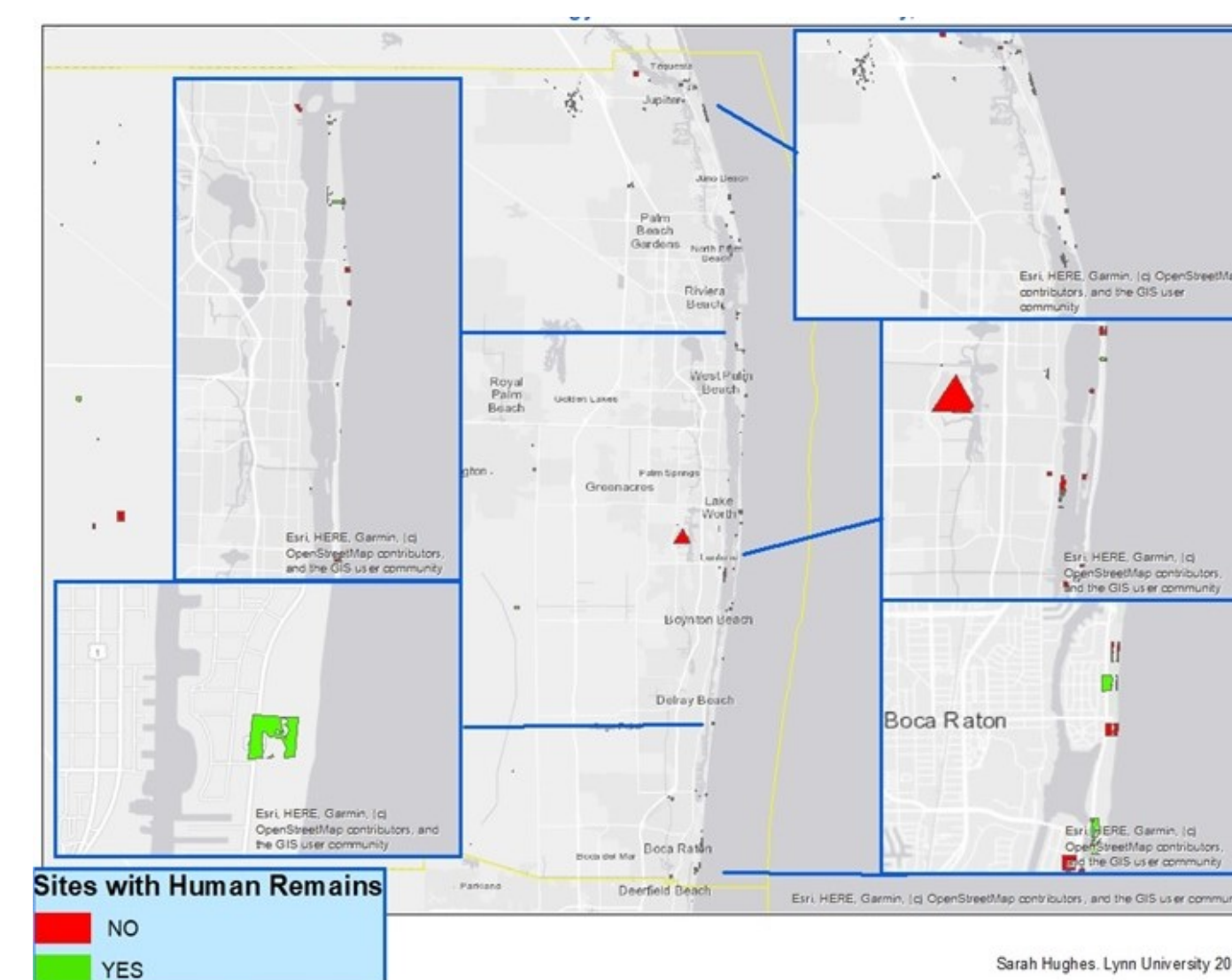


Figure 1: An excavated unit on a barrier island site

Figure 2: All sites in Palm Beach County at risk of submergence due to sea level rise³*

*Under Florida Statute Chapter 267 archeological sites are protected and not to be disturbed without appropriate permitting.

Acknowledgements

This work could not have occurred without assistance from many people, including the Palm Beach County Office of Resilience and Sustainability, the County Archeologist Chris Davenport, the Florida Public Archeology Network (Sara Ayers-Rigsby & Micheline Hilpert), and Lynn University Undergraduates Sarah Hughes, Jack Meyers, Cheree' Faulk, and John McDowell.

Take Home Points

- Archeological sites on Florida barrier islands are at risk of destruction due to sea level rise
- Increased moisture due to sea level rise has already been observed at low elevation barrier island sites
- Site preservation and excavation plans must be adjusted to account for current impacts

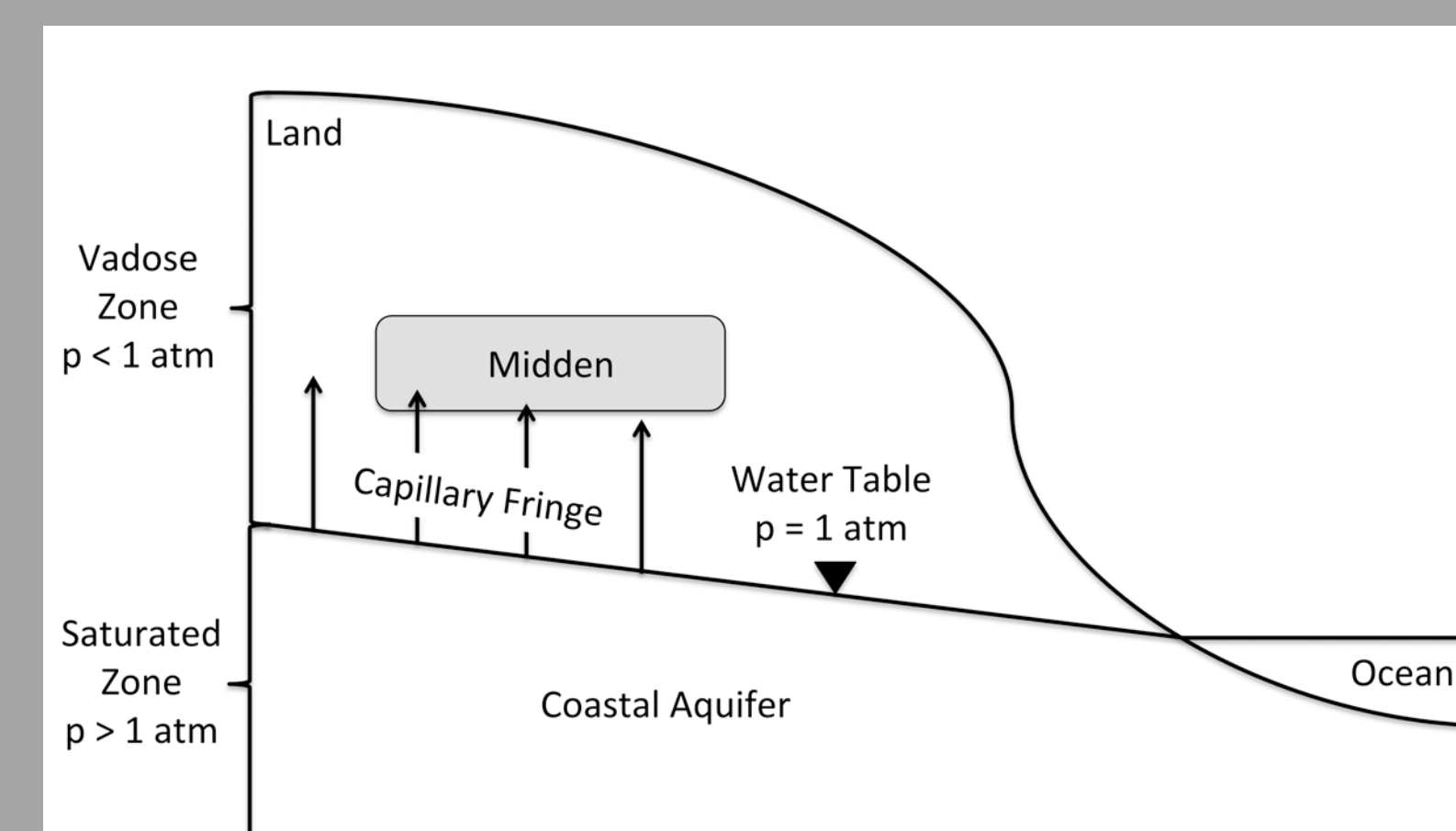


Figure 5: A conceptual model showing how the capillary fringe of sea water intrusion is wetting low-elevation archeological sites

3. This Project

- A barrier island archeological site was excavated in 2018 and 2019 as commissioned by the climate compact
- Shovel tests were used to determine site extent
- Three habitation sites were discovered and excavated a 1 x 1 x 1 m units.
- Units were excavated in 10 cm layers
- Artifacts (bone, shell, pottery) were retained for analysis

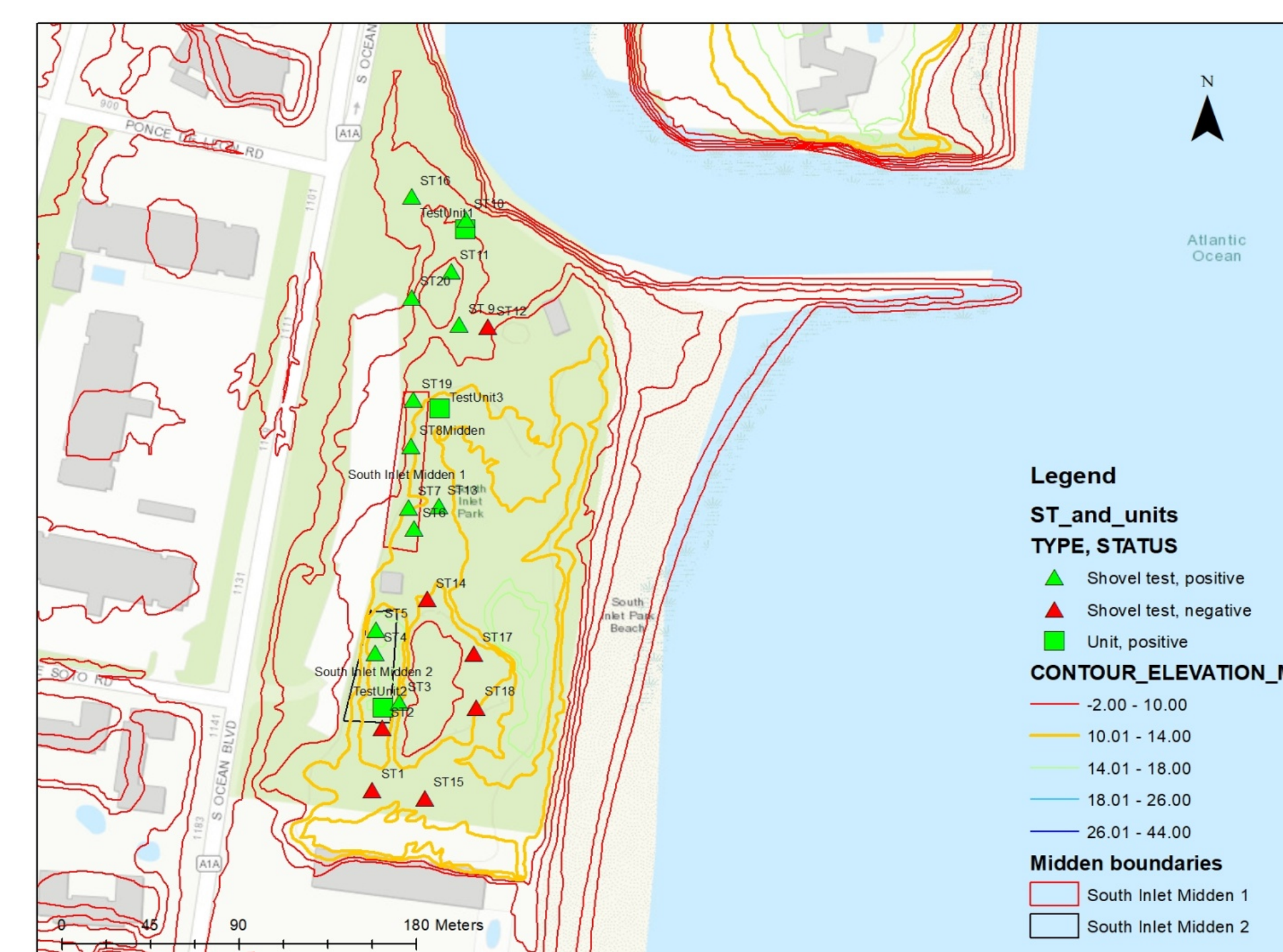


Figure 3: Location of shovel test and full 1 x 1 x 1 m unit excavations⁴

- After excavation ~600 g of sediment was sampled from the most intact unit wall
- Sediment was dried and sieved to attain moisture and grain size

4. Results

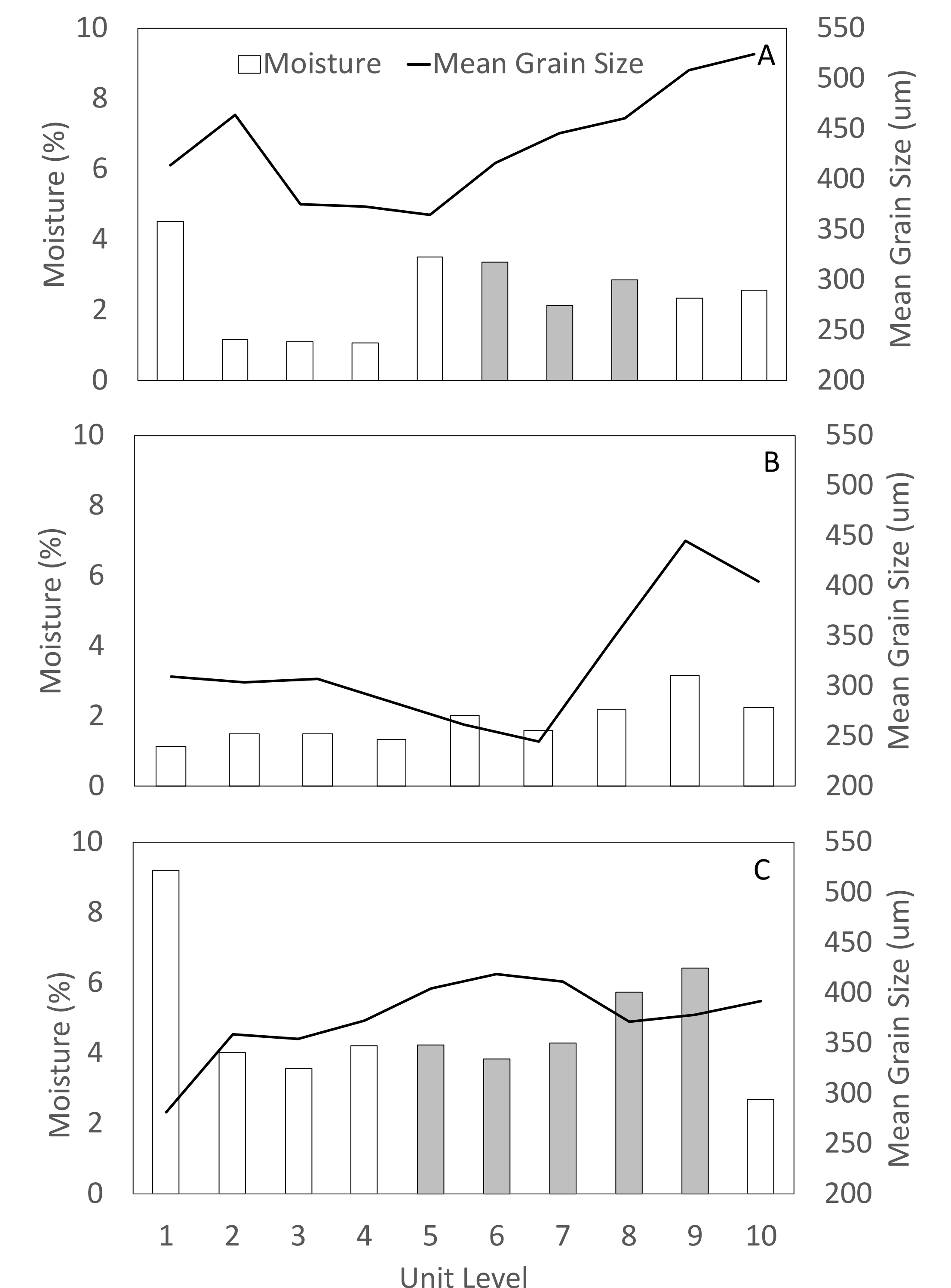


Figure 4: Moisture content and geometric mean grain size of every level for each unit. (A) the lowest elevation Unit 1 with a bone midden contains lower levels that are significantly wetter than the upper levels ($p < 0.05$), possibly indicating of rising sea water within the island. (B) the highest elevation Unit 2 contained no midden and had similar moisture content throughout. (C) The middle elevation Unit 3 was a shell midden with similar moisture throughout, possibility indicating the shells trapped moisture within the midden. Shell artifacts were found throughout all layers at that site. Grain size was medium-coarse sand throughout all levels of all units. Grey bars indicate a midden layer.

References

- ¹Florida Division of Cultural Resources (2019) Manasota Key Offshore, Florida Department of State, Retrieved from: <https://dos.myflorida.com/historical/archaeology/projects/manasota-key-offshore/>
- ²Conard, N. J., Walker, S. J., & Kandel, A. W. (2008). How heating and cooling and wetting and drying can destroy dense faunal elements and lead to differential preservation. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 266(3-4), 236-245.
- ³Hughes, S. (2019) Low Archeology Sites Found In Palm Beach County
- ⁴McDowell, J., Meyers, J., Lecher, A.L., Watson, A. (2019) Examining the Effects of Screen Size on Archaeological Data Collection, Lynn University College of Arts and Sciences Student Symposium, Poster