



Florida Keys Aquatic Preserves Seagrass Monitoring Program

Mackenzie Magyar¹, Veronica Lopez², & Dr. Nicholas Parr¹

¹Florida Keys Aquatic Preserves, Florida Department of Environmental Protection, Marathon, FL, USA

²Biscayne Bay Aquatic Preserve, Florida Department of Environmental Protection, Miami, FL, USA

Lignumvitae Key Aquatic Preserve

Lignumvitae Key Aquatic Preserve (LKAP) is a 6,700-acre transitional zone located between the Upper and Lower Matacumbe Keys that was established in 1969 to conserve and protect the coastal waters of the Florida Keys. The LKAP management plan was updated in 2022 and outlines initiatives in water quality improvement, natural resource monitoring programs, and education program goals.¹ As seen in Figure 1, LKAP overlaps with Lignumvitae Key Botanical State Park.

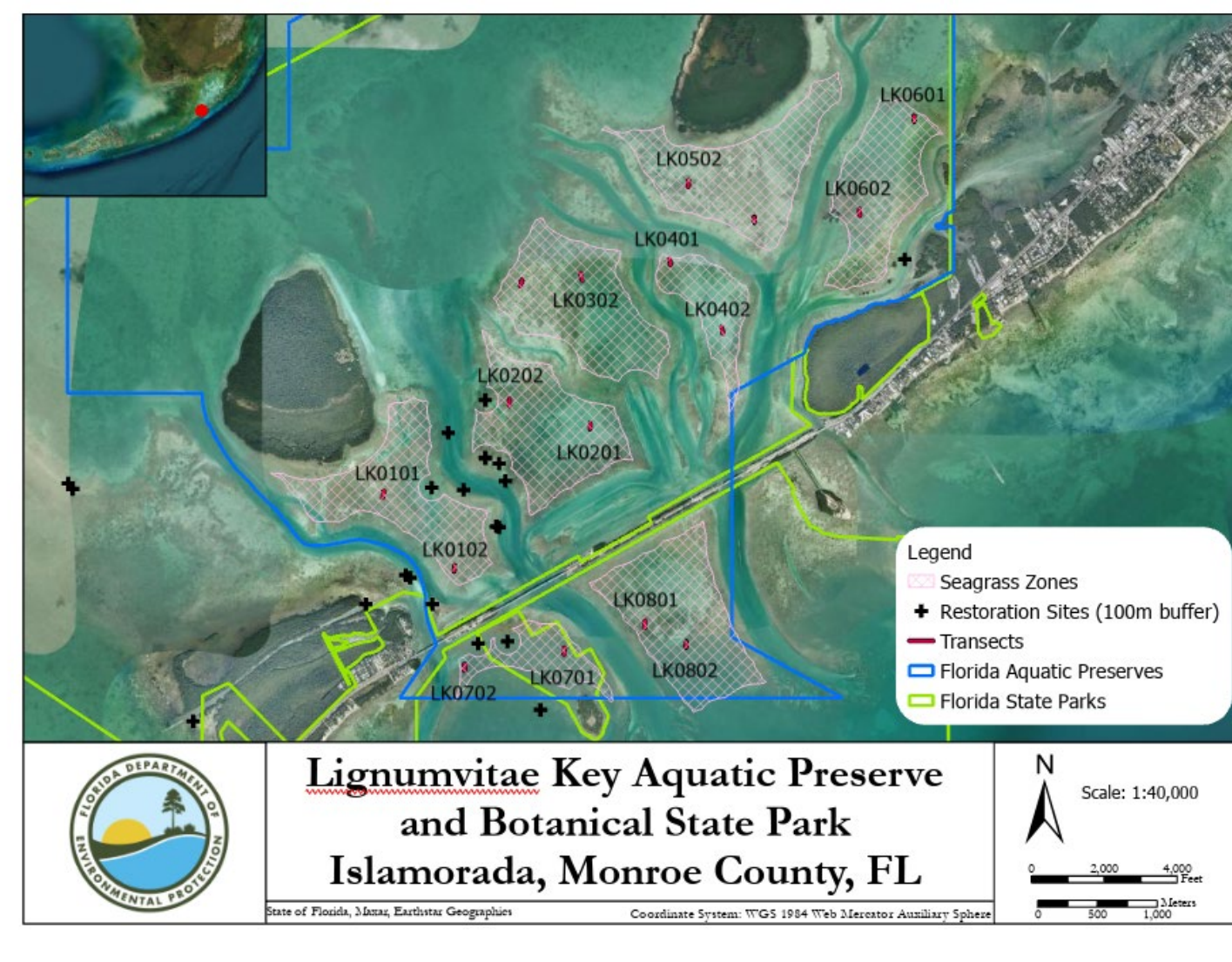


Figure 1: Map of LKAP monitoring program zones and transects.

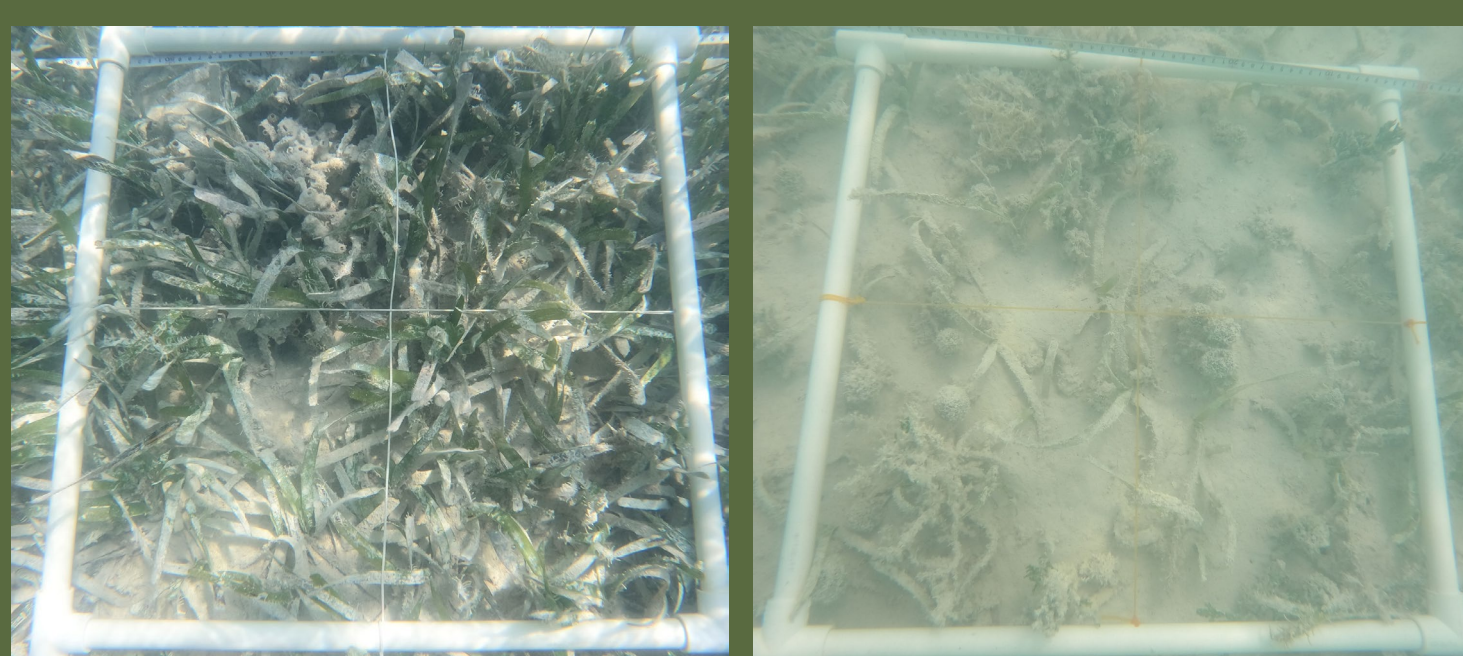


Figure 2: Photos of quads from different sites within LKAP showing variability.

The seagrass monitoring program was established in 2021 to create a long-term dataset tracking community composition and seagrass densities at a high resolution. Each flat is broken into zones that are divided naturally by channels, then divided into two randomly generated sites as visualized in Figure 1.

Monitoring Protocol

Data is collected semiannually, following Florida Keys wet (June-October) and dry (December-April) seasons. As shown in Figure 3, all sites have a permanent north and south stake 50 meters apart. Divers collect data at 10 randomized meter marks using a 0.25 m² quadrat at each site starting at the south point (meter mark 0). All divers collecting data perform quality control each season between each other. Initial site assessment includes estimates of current and visibility as well as depth. At each quad, divers determine sediment type and quantify species cover through percent and Braun Blanquet Score (BBCA) for all submerged aquatic vegetation (SAV), macroalgae, corals, sponges, and tunicates. For SAV only, measurements also include average canopy height, categorization of epiphytic coverage, and a count of all shoots in the quad area. Non-vegetation organisms (e.g. snails) are quantified by count only.

BBCA Score	Individuals	%Coverage
0.1	1	<5
0.5	2-5	<5
1	>5	<5
2	-	<25
3	-	<50
4	-	<75
5	-	>75

Table 1: BBBCA Scoring Chart

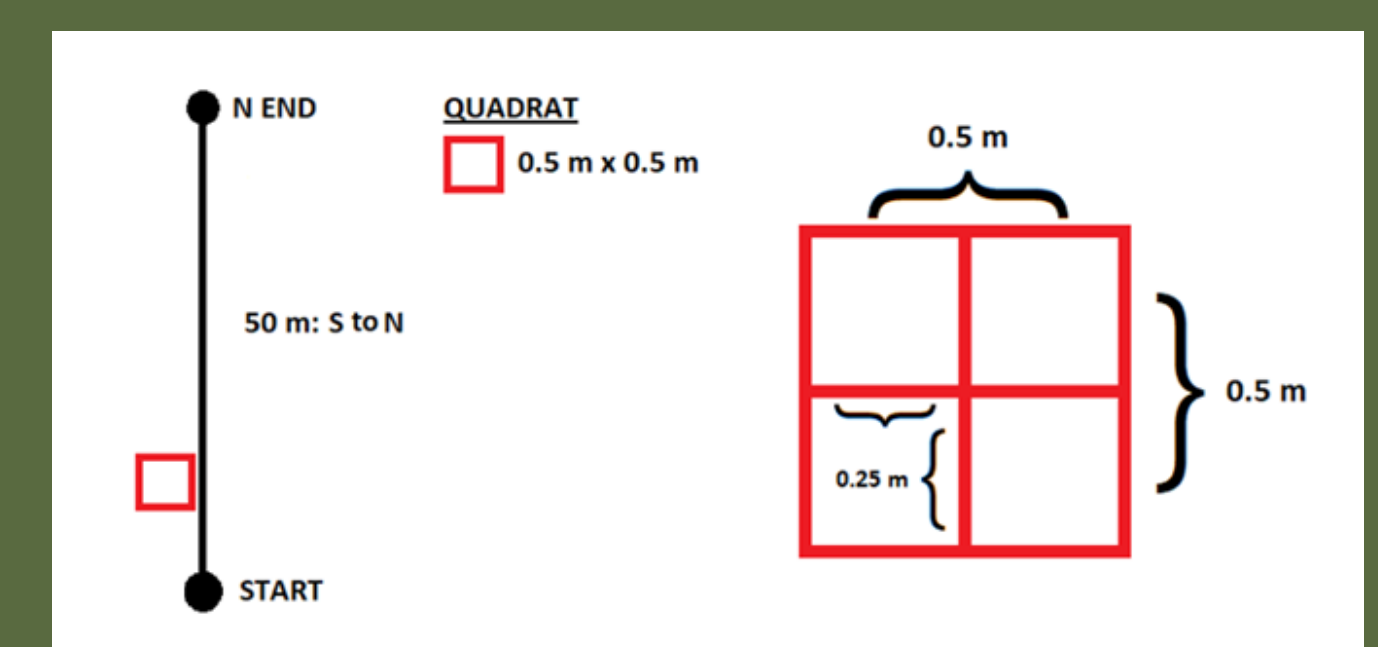


Figure 3: General site layout and quadrat size

Results and Discussion

Seagrass Demographics

All 2024 program data has been uploaded and is currently available through DEP's SEACAR Data Discovery Interface². Since the start of the program in 2021, shoot count has been a consistent metric to quantify seagrass density. In 2023, methodology for conducting percent cover and BBBCA was changed from the "lawnmower" (basil cover) method to the "shading method" (canopy cover) to better align with FIU's Seagrass Ecosystems Research Lab. Figure 4 shows *Thalassia testudinum* (Tt) density by season from 2021 to the most current season of 2025. Sites are shown in different shades of the same color with each zone having a unique point. Figure 5 shows the mean over the 5 years the program has been collecting data for each site. Sites are labeled on Figure 1.

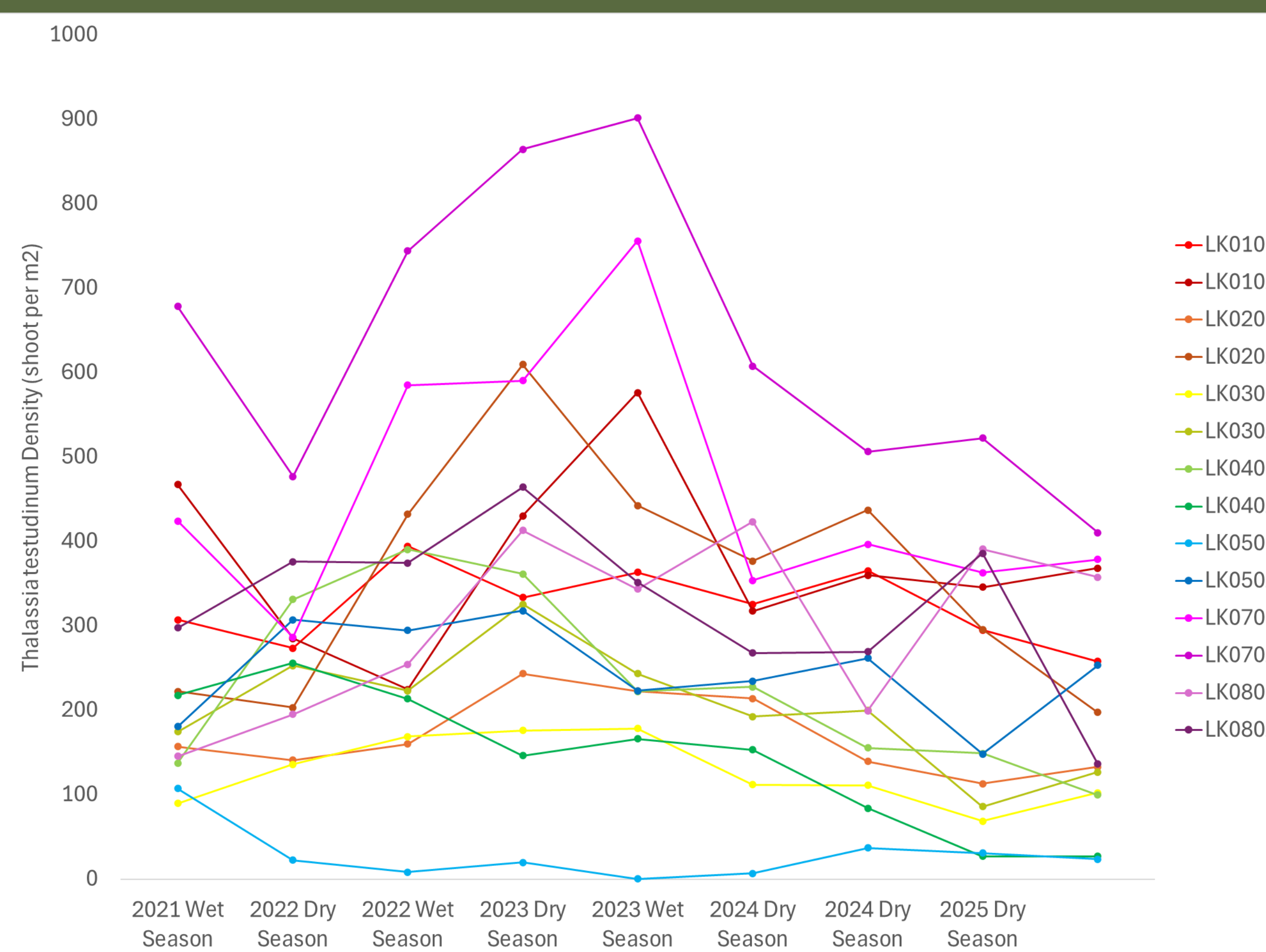


Figure 4: Shoot density of *Thalassia testudinum* by season from 2021 to 2025. Data from Zone 6 was not included since it is macroalgae dominated with little seagrass.

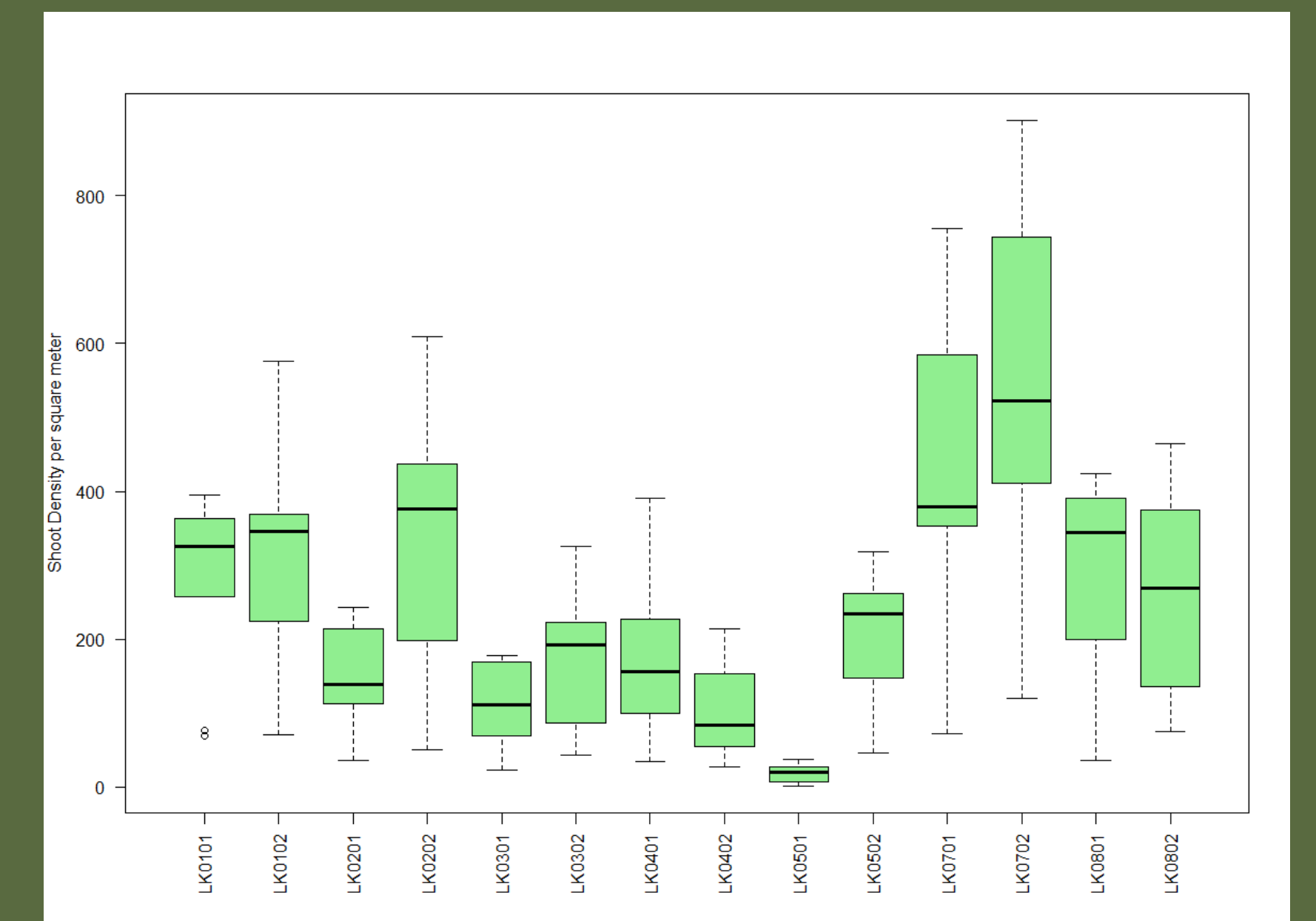


Figure 5: Baseline *Thalassia testudinum* density data based on data collected from 2021 to 2025.

Future Directions

Further analysis of the LKAP data could reveal trends in seagrass health. This program will continue to collect seagrass community data semiannually in LKAP to further the long-term dataset. With seasonal data over multiple years, high-resolution data can be used to closely observe trends in seagrass health that can be applied across seagrass flats throughout the Florida Keys.

The seagrass monitoring program in the Coupon Bight Aquatic Preserve (CBAP) was established this year (2025) during the dry season. This program, currently with only two seasons of data, will continue alongside the ongoing hardbottom monitoring program in CBAP to contribute to our Growing benthic dataset for the area.

This data can be combined with FIU's seagrass data throughout the Florida Keys for a more robust analysis of regional seagrass trends.



Figure 8: FKAP Staff performing benthic survey

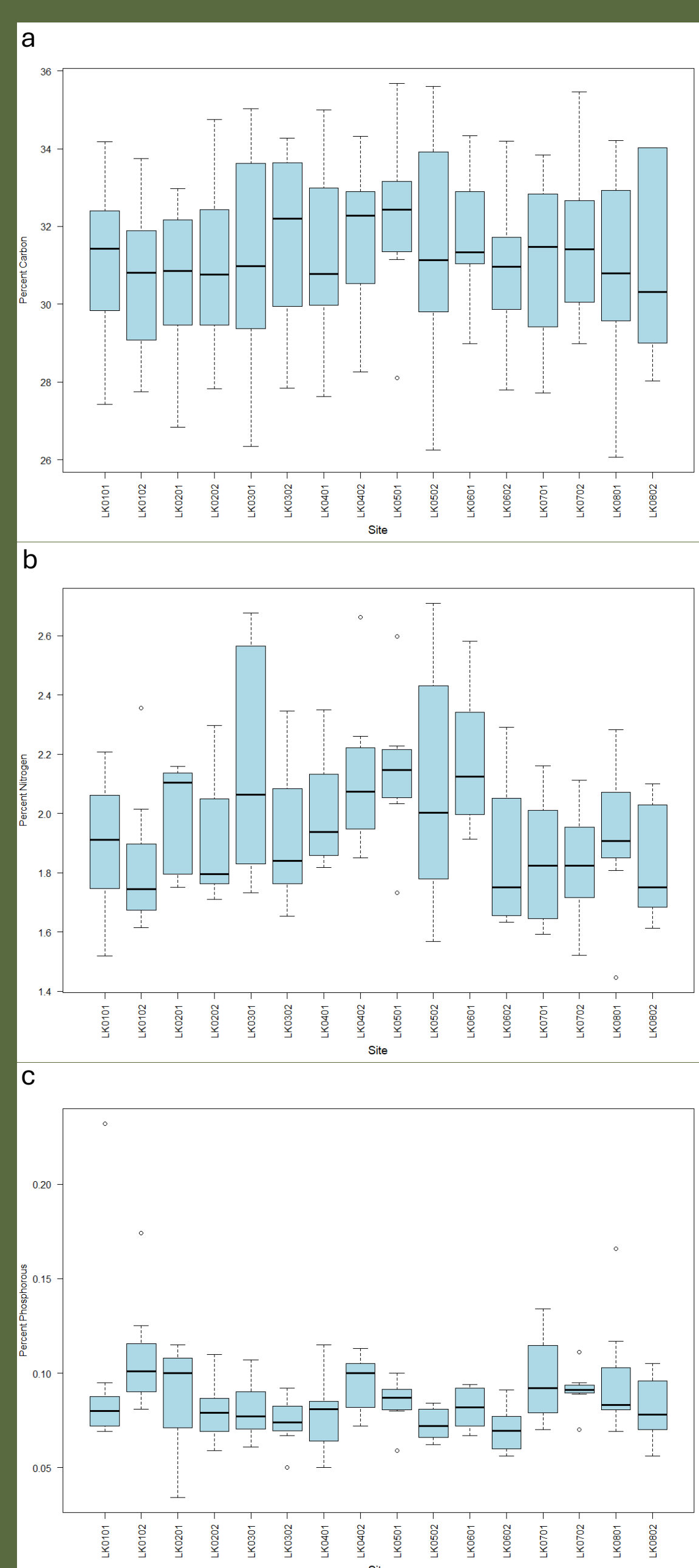


Figure 6: Baseline data for (a) carbon, (b) nitrogen, and (c) phosphorous

Overall, there has been little change in Tt density over the past 5 years. Both sites in zone 7 have seen a large increase then decrease. Both sites in zone 4 have decreased slightly.

Nutrient and Isotope Data

Figures 6 and 7 contain baseline nutrient and isotope data for Tt only. This data starts in 2021 alongside benthic monitoring but only goes until the 2025 dry season as wet season samples have recently been sent to FIU for analysis. Seen in figure 6c, nutrient content for phosphorous is similar between sites with less of a range for each site, whereas nitrogen, shown in figure 6b has much larger ranges and sites are less similar between each other each other. Carbon has a stable baseline and fewer outliers than both nitrogen and phosphorous.

When looking at isotope data for carbon, shown in Figure 7a, site LK0402 has a much lower value than all other sites where most sites are consistent with each other. Nitrogen isotope data differs between most sites, with a large range and many outliers. Both sets of data are a great candidates for further statistical analyses.

Over time, the nutrient and isotope data can show chronic issues with water quality impacting the seagrass. Additionally, if a seagrass die-off occurs, it can reveal if acute anthropogenic eutrophication was the probable cause.

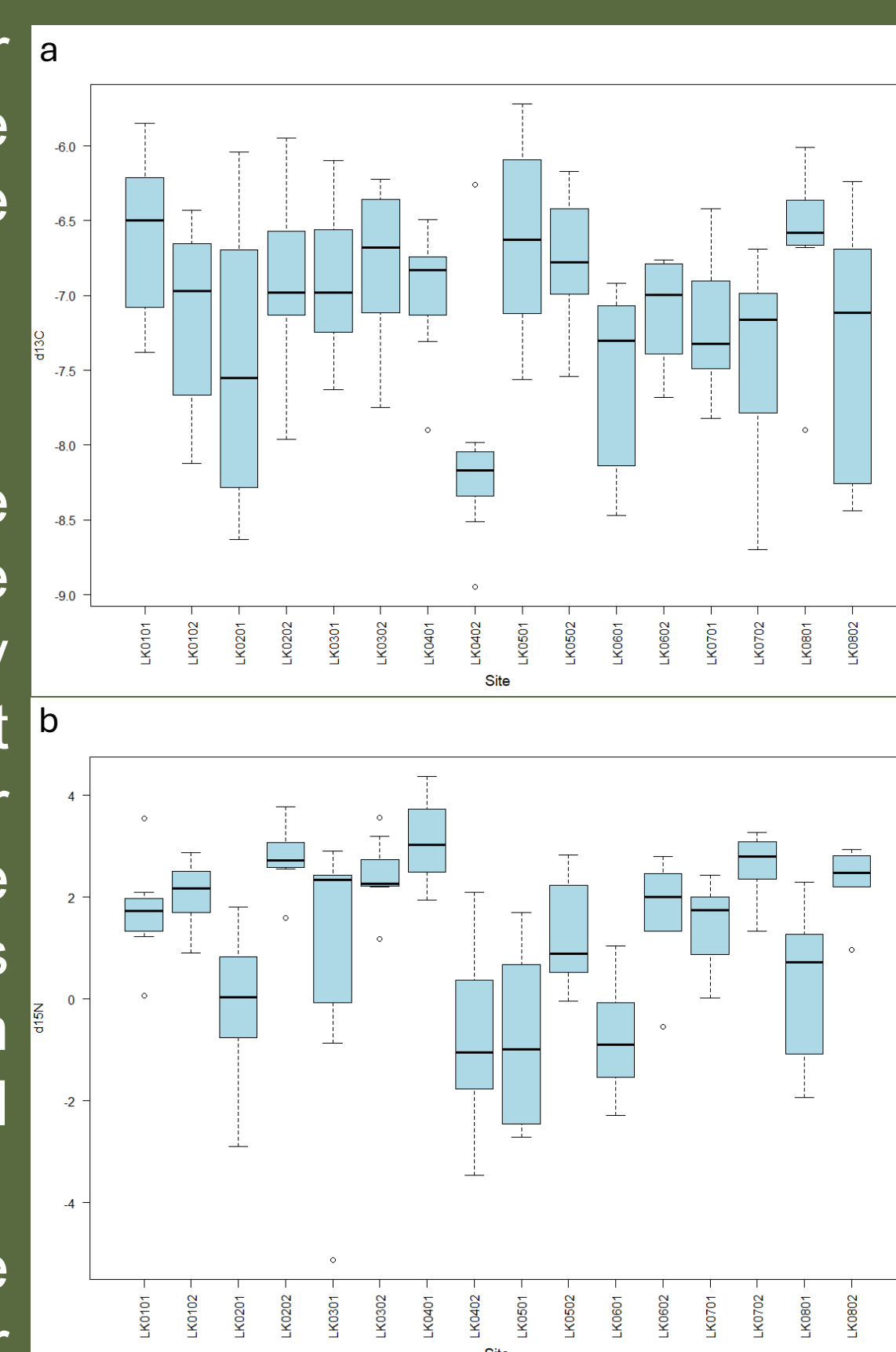


Figure 7: Baseline data for (a) carbon (d13C) and (b) nitrogen (d15N)

References

- ¹ FDEP, Lignumvitae Key Aquatic Preserve Management Plan (2022) <https://floridaaquaticpreserves.org/sites/default/files/resources/Lignumvitae-Key-AP-Management-Plan.pdf>
- ² FDEP, Statewide Ecosystem Assessment of Coastal and Aquatic Resources (SEACAR) <https://data.florida-seacar.org/>

Acknowledgements

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