



Periphyton Monitoring in Big Cypress National Preserve

2022

Importance and Overview

Periphyton is a common and ecologically important component of South Florida non-forested wetlands, such as those found in the Big Cypress National Preserve (BICY). It is a critical basal component of the food web of these wetlands where it is responsible for a large proportion of primary production, creation of calcitic soil (marl), and control of nutrient upwelling. Periphyton communities (diatoms, etc.) change compositionally in direct response to changes in nutrients, salinity, and water management. Diatom composition reflects changes in these environmental variables as they occur over prolonged periods of time, and thus provides a better, holistic indicator of water quality than monthly water-column measurements (Figure 1).

Diatom community structure is an important index of water quality and overall wetland health. Diatoms are used by state and federal agencies as a system-wide indicator for Everglades Restoration. The long-term monitoring of diatoms provides resource managers with a more complete picture of a biological community responding to water quality and implications for future water-management decisions.

Objectives and Approach

The overall goal of monitoring is to assess water quality within the marsh habitats in northwestern Big Cypress National Preserve using total phosphorus (TP) and diatom metrics. The South Florida/Caribbean Network is targeting marshes in northwest Big Cypress National Preserve in seven basins, deemed a highest priority. The sampling design is a restricted random sample of marshes within each basin to establish permanent sites (Figure 2). Sites are sampled every Hydro Year (HY; May 1 to April 30 the next year). HY2022 was May 1, 2022 to April 30, 2023.



Figure 1. Impacted site in Okaloacoochee Slough with green algae.

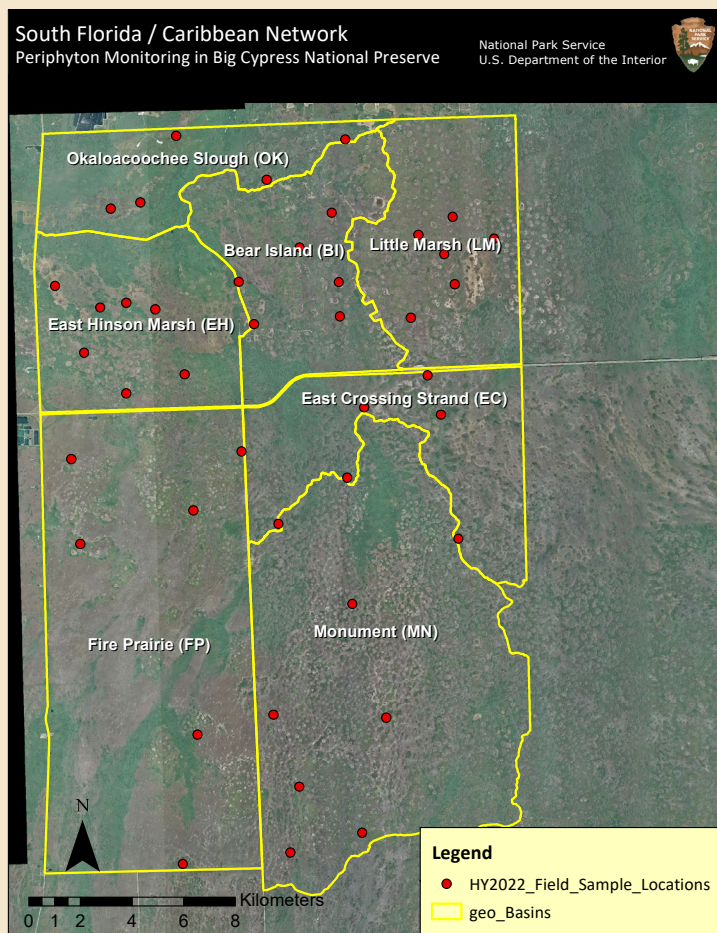


Figure 2. The location of 42 periphyton sites sampled during the 2022 Hydro Year. The Western BICY Vegetation Map was used to determine all sampleable freshwater graminoid marsh habitat.



Figure 3. Unimpacted site in East Crossing Strand with periphyton.



Objectives and Approach (continued)

The specific objectives of periphyton monitoring are:

- Identify any basins in the northwest section of Big Cypress National Preserve where periphyton community structure and periphyton TP content are different from an oligotrophic (low-nutrient) and unimpacted community signal (Figure 3).
- Document any temporal and/or spatial changes in the periphyton community structure and periphyton TP content showing progression toward an oligotrophic, unimpacted condition or a eutrophic (high-nutrient), impacted condition.

Protocol Status and Results

The fourth year of monitoring was conducted in November and December 2022, during the 2022 Hydro Year (May 1, 2022–April 31, 2023). Forty-two sites were visited via helicopter (Figure 4), ATV, and hiking (Figure 5), where 94 bottled samples of periphyton were collected; along with 47 TP samples and 47 diatom samples. Preliminary interpretation of the ordination graph created by non-metric multi-dimensional scaling (NMDS; fourth root transformation) of diatom assemblages from the HY2022 periphyton samples is shown in Figure 6. The stress for the NMDS is 0.17, suggesting this ordination should be interpreted with caution (Clarke et al. 2014).

The grouping of the periphyton mat total phosphorous levels (green, yellow, red and purple) are based on threshold values from periphyton monitoring data that occurs in the Everglades. We are working on developing threshold values for mat total phosphorous levels specific to Big Cypress. The data (Figure 6) suggest that low TP sites (green) in the diatom communities are clustered together suggesting they have similar composition of diatom species and abundances in those samples. The dashed lines encircling the low phosphorous samples indicate they have 40% similarity in composition to each other. At the higher TP sites (purple) the diatom communities are quite distinct between samples. There is only about 20% similarity in these samples which suggests high TP levels may be changing the diatom species composition within samples collected.

Literature Cited

Clarke, K. R., R. N. Gorley, P. J. Somerfield and R. M. Warwick. 2014. Change in marine communities: an approach to statistical analysis and interpretation.



Figure 4. Helicopter in a marsh outside of the sampling area. In December 2022, 32 sites were visited via helicopter.



Figure 5. Three NPS staff members collecting data. In November 2022, four sites were visited via hiking.

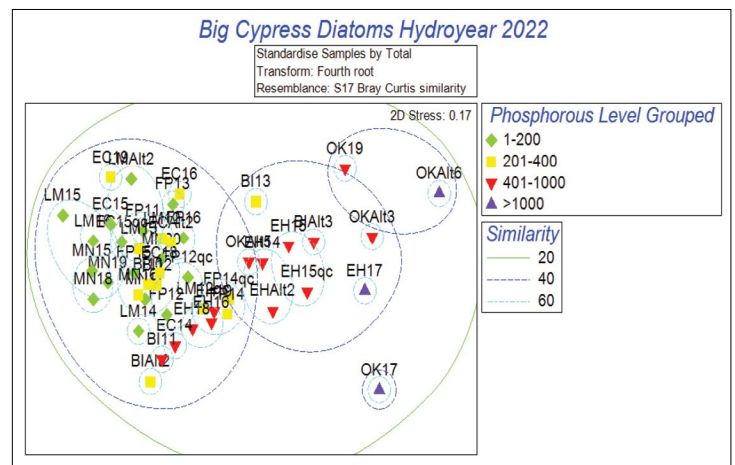


Figure 6. Ordination graph depicting the diatom community assemblage found in HY 2022 periphyton samples and mat total phosphorous $\mu\text{g/g}$ (data processing level = provisional). Text inside the graphic indicates site name.

