5.0 HABITAT

5.1 Introduction

The Florida Everglades ecosystem is one of the largest freshwater wetland complexes in the US. This wetland complex, which extends from Lake Okeechobee south to Florida Bay, west to BCNP, and east to the coastal ridge (Gunderson 1994), has been studied intensively, resulting in an extensive literature base on the flora of the Everglades. Everglades plant community associations, spatial and temporal distribution of plant communities, and natural or anthropomorphic factors influencing these distributions have been studied, as well as factors contributing to and accelerating changes in plant community distributions and composition. For example, Gunderson and Loftus (1993), Olmsted and Loope (1984), Craighead (1971), Loveless (1959), Robertson (1953), Davis (1943), and others provide accounts of historical and current vegetative characteristics of the Everglades. Recent vegetation classification maps have been published for LNWR (Richardson et al. 1990), WCA2A (Jensen et al. 1995, Rutchey and Vilcheck 1994), and Shark River Slough (Gunderson et al. 1986). Gunderson (1994), Bodle et al. (1994), and Davis (1994) provide overviews and syntheses of factors affecting change in this ecosystem.

The natural mosaic of plant community types in the Everglades provides a diverse array of habitats for wildlife, including many threatened and endangered species. Wet prairies and open water areas void of dense emergent macrophytes serve as preferred wading bird foraging habitat (Hoffman et al. 1994). Fleming et al. (1994) note the importance of habitat heterogeneity to Everglades wood stork populations.

Changes in plant community composition, structure, and spatial distributions as a result of ecosystem stressors can lead to changes in animal populations, communities, and wildlife species diversity. For example, changes in the plant community composition, structure, and spatial distributions are hypothesized to be important factors in the potential bioavailability and bioaccumulation of MeHg in fish and wading birds in the marsh (see Chapter 8.0 for further discussion). A consistent characterization of plant community attributes concomitant with the characterization of other indicators of ecosystem stressors or conditions, however, has not been

conducted to date on an ecosystem scale in the Everglades. A preliminary characterization of the plant communities at the marsh sampling stations, therefore, was conducted as part of the Everglades ecosystem assessment project.

Data were collected on the dominant and secondary plant communities present at the marsh sampling sites to provide an initial characterization of habitats within the marsh. Using a simplified vegetation classification scheme based on dominant species, Everglades marsh habitat was qualitatively grouped into six broad dominance classes: (1) wet prairie, (2) sawgrass marsh, (3) cattail marsh, (4) cypress, (5) *Muhlenbergia* prairie, and (6) mangroves. The habitat classes were further divided into nine secondary plant community classes: (1) wet prairie, (2) sawgrass marsh, (3) cattail marsh, (4) cypress, (5) *Muhlenbergia* prairie, (6) mangroves, (7) willow (*Salix sp.*), (8) Melaleuca (*Melaleuca quinquenervia*), and (9) pine. The field crew selected the dominant and secondary vegetation community type based on field observations and recorded these observations on field sheets. In addition, three 35 mm color slides were taken at each marsh sampling location as described in Chapter 3.0. Dominant and secondary communities recorded from 35 mm color slides were compared to field sheets to verify consistency in community characterization between sampling crews. In addition, the presence or absence of cattail (*Typha spp.*), an opportunistic species that outcompetes the more slowly growing species adapted to the low nutrient environment of the unimpacted Everglades (Davis 1994), was recorded from the slides.

Attached and floating periphyton mats are common in Everglades habitats, particularly in wet prairies and deeper slough areas. These biological communities have been shown to serve multiple functions. Periphyton productivity oxygenates the water column (Belanger et al. 1989, McCormick et al. 1997). Everglades periphyton also influence calcium carbonate deposition and nutrient cycling in the marsh (Swift and Nicholas 1987), and serve as a food web base (Browder et al. 1994). Recent studies by Cleckner et al. (Personal communication) also demonstrate that floating periphyton mats can be sites for Hg methylation in the Everglades ecosystem. Slight increases in nutrient concentrations, particularly phosphorus can cause changes to the periphyton assemblage, including species composition and biomass (Raschke 1993, McCormick et al. 1997). The presence or absence of floating periphyton mats, which are a sensitive indicator of marsh

ecosystem status (Raschke 1993, McCormick et al. 1997), was noted on field sheets and also recorded from photographs taken at each sampling station.

The preliminary habitat data (i.e., plant community, cattail presence, floating periphyton mat presence) were evaluated using various descriptive statistics and spatial presentations to identify patterns in plant community distributions, species occurrences, and the potential relationships among these patterns within the Everglades marsh ecosystem.

5.2 Results

5.2.1 Spatial Distribution of Dominant Plant Communities

Figure 5.1 provides a histogram showing the number of marsh sampling locations within each dominant vegetation class. Out of the six dominant plant community classes, sawgrass marsh and wet prairies were recorded most often as the dominant plant community class at the sampling locations. Subsequent data analyses, therefore, focused on these predominant marsh habitat types. Scatter plot diagrams of sawgrass dominated plant communities, wet prairie dominated plant communities, and the presence of cattails and floating periphyton mats along a north to south latitudinal gradient are shown in Figure 5.2. The dominant plant community classes and the presence of cattails and floating periphyton are not equally distributed across a north to south latitudinal gradient in the Everglades. Further examination of the distribution of vegetation classes on a finer scale (Figure 5.3) shows that changes in plant community composition in the marsh occur over 6 broad latitudinal subdivisions, which are enumerated as follows: (1) LNWR composed of LNWR, northern WCA2A, Holeyland, and Rotenberger tract; (2) Alligator Alley north (AA-N) composed of the area north of Alligator Alley to LNWR and including most of WCA2A, WCA2B, and northern portions of WCA3 and BCNP; (3) central WCA3 (WCA3-C) composed of the central third of WCA3 and BCNP; (4) southern WCA3 (WCA3-S) composed of the southern third of WCA3 and BCNP; (5) northern ENP (ENP-N) composed of the northern half of ENP; and (6) southern ENP (ENP-S) composed of the southern freshwater half of ENP (Figure 5.4). Figures 5.3 and 5.5 show that wet prairie is the dominant plant community class in latitudinal subdivision LNWR with sawgrass as the secondary dominant plant community type. Few cattails or floating periphyton mats were recorded from sampling stations found in this

subdivision (Figures 5.6 and 5.7). Figure 5.6 shows that where cattails are present in LNWR, they are located on the exterior of LNWR near the canals.

A shift in the dominant plant community class occurs in latitudinal subdivision north of Alligator Alley, where sawgrass replaces wet prairie as the dominant plant community class (Figures 5.3 and 5.8). Approximately 58% of the total marsh area sampled in this latitudinal subdivision is dominated by sawgrass and approximately 14% of the marsh area sampled is dominated by wet prairie (Table 5.1). In comparison, 39% of the marsh area sampled is dominated by sawgrass and 51% of the area sampled is dominated by wet prairie in the LNWR latitudinal subdivision (Table 5.1).

Preliminary observations of the sawgrass dominated community in the latitudinal subdivision north of Alligator Alley also revealed that the sawgrass vegetation in this latitude is more robust in its overall growth as represented by observed height and density. Turner et al. (1995) documented macrophyte heights of over 4 m (13 ft) in WCA3A compared to about 1 to 3 m (3.5 to 10 ft) in ENP.

In central and southern WCA3 and in the northern portion of ENP, there is a shift back to wet prairie as the dominant plant community (Figures 5.3 and 5.5). In these areas, the percentage of marsh area sampled that is dominated by wet prairie ranges from 43% to 57%. In contrast, the percent marsh area sampled that is dominated by sawgrass in these same areas ranges from 29% to 41% (Table 5.1). In the southern portion of ENP, however, the dominant plant community again shifts to sawgrass dominated marsh (Figure 5.3) with 52% of the total marsh area in the southern portion of ENP dominated by sawgrass compared to 29% dominated by wet prairie (Table 5.1).

5.2.2 Presence and Distribution of Cattails and Floating Periphyton Mats

Figures 5.2, 5.3, and 5.6 show that there is a distinct spatial distribution of cattails within the Everglades marsh communities. Cattails are present within the marsh more frequently north of Alligator Alley than in any other subarea. Figure 5.6 also shows that in the WCA3-C the presence of cattails within the marsh community is concentrated near the L67 canal. Cattails are also common in the Holeyland and WCA2A.

Table 5.1 Proportion of marsh habitat sampled dominated by the major plant community classes within the six latitudinal subdivision along a north to south gradient. Proportion represents the proportion of marsh area sampled within each latitudinal subdivision.

Dominant Plant Community Class	Area km^2	Proportion %
LNWR		
Wet Prairie	424	51%
Sawgrass	331	39%
Cypress	0	0%
Cattail	79	10%
North of Alligator Alley (AA-N)		
Wet Prairie	212	14%
Sawgrass	887	58%
Cypress	199	13%
Cattail	146	10%
Central WCA3 (WCA3-C)		
Wet Prairie	715	43%
Sawgrass	503	30%
Cypress	437	26%
Cattail	0	0%
Southern WCA3 (WCA3-S)		
Wet Prairie	755	52%
Sawgrass	410	29%
Cypress	172	12%
Cattail	13	10%
Northern ENP (ENP-N)		
Wet Prairie	688	57%
Sawgrass	503	41%
Cypress	0	0%
Cattail	26	2%
Southern ENP (ENP-S)		
Wet Prairie	318	29%
Sawgrass	569	52%
Cypress	13	1%
Muhlenbergia	146	13%
Cattail	26	2%
Mangrove	13	1%

Figure 5.7 shows the distribution of the presence of floating periphyton mats in the Everglades marsh. Preliminary observations on the periphyton community in LNWR, indicate that the periphyton community is distinctly different in species composition than the rest of the Everglades (Browder et al. 1994). These preliminary observations suggest that the periphyton community in LNWR has developed in response to a different set of controlling variables or factors (e.g., water pH, conductivity, hydrologic source, temporal patterns in hydrology, etc.) than found elsewhere in the Everglades. Swift and Nicholas (1987) documented different periphyton characteristics in LNWR attributed to water chemistry. Figure 5.3, which provides the percent frequency of occurrence of floating periphyton mats within each of the six latitudinal subdivisions, shows that floating periphyton mats are present most frequently in southern and central WCA3 and northern ENP. The presence of floating periphyton within the marsh is lowest in LNWR and north of Alligator Alley.

Table 5.2 summarizes the percent of the total marsh area sampled where cattails and floating periphyton mats are present within each of the six latitudinal divisions in the Everglades. The percent of the marsh area sampled where cattails are present is highest in the Alligator Alley north (i.e., 21% of the total marsh area sampled) and LNWR (i.e., 16% of the total marsh area sampled). In contrast, the percent of the total marsh area where periphyton mats are present is lowest in the latitudinal subdivision LNWR (i.e., 16%), increases along a north to south latitudinal gradient, and is highest in southern WCA3 and the northern ENP (i.e., 64% and 77%, respectively). Similar patterns are observed for floating periphyton along a latitudinal gradient from north to south in the marsh (Figure 5.3 and 5.7).

5.3 Synthesis

Several patterns in the spatial distribution of plant communities and habitat types within the Everglades emerge from the preliminary data collected at the Everglades marsh sampling locations. Most noticeable are (1) that the dominant plant community classes are not equally distributed across the Everglades, (2) there are shifts in sawgrass and wet prairie dominant plant communities over 6 latitudinal subdivisions (Figure 5.3), (3) the presence of cattails and cattail dominant communities north of Alligator Alley near the EAA (Figure 5.6), and (4) the presence

Table 5.2 Proportion of marsh area sampled in each latitudinal subdivision where cattail (*Typha domingensis*) and floating periphyton mats were present.

Presence of Cattails and Floating Periphyton Mat	Area km^2	Proportion %
LNWR		
Cattail	132	16%
Floating periphyton mat	132	16%
North of Alligator Alley (AA-N)		
Cattail	318	21%
Floating periphyton mat	331	22%
Central WCA3 (WCA3-C)		
Cattail	93	6%
Floating periphyton mat	807	49%
Southern WCA3 (WCA3-S)		
Cattail	79	6%
Floating periphyton mat	914	64%
Northern ENP (ENP-N)		
Cattail	40	3%
Floating periphyton mat	940	77%
Southern ENP (ENP-S)		
Cattail	13	1%
Floating periphyton mat	609	56%

of floating periphyton mats in the central and southern portions of WCA3 and in northern ENP where cattails are largely absent (Figures 5.6 and 5.7).

In general, sawgrass dominant communities and the presence of cattails have the highest frequency of occurrence north of Alligator Alley, and wet prairie dominant communities and the presence of floating periphyton mats occur more frequently in the central and southern portions of WCA3 and in the northern half of ENP. There is a noticeable shift from wet prairie dominant

communities in LNWR to either cattail dominant plant communities or sawgrass dominant plant communities with a high presence of cattails north of Alligator Alley, and a noticeable shift back to wet prairie dominant communities in the central and southern portions of WCA3 and northern ENP.

Although data were not collected on the density, height, and aboveground biomass of marsh vegetation, sawgrass and cattail plants were noticeably taller and appeared to be denser north of Alligator Alley and in the marsh adjacent to the canals based on field observations. These observations suggest that where plant species density, height, and aboveground biomass are high, shading may preclude the development or presence of floating periphyton mats (Grimshaw et al. 1997). For example, in the central and southern thirds of WCA3 and the northern half of ENP, where the wet prairie community is dominant and where macrophyte species density, height, and aboveground biomass appear to be low, the frequency of periphyton mats is high. These observations are consistent with Browder et al. (1994) who indicates that epiphytic and floating periphyton mats are an integral component of wet prairie communities and plant communities of deeper slough areas of the Everglades.

Changes in the composition, structure, and the spatial and temporal distribution of plant communities within the Everglades are driven by numerous factors, including changes in natural hydroperiod, salinity, and nutrient concentrations, and natural disturbances such as fire, frosts, and hurricanes (Gunderson 1994). However, subtle changes in vegetation and habitat within the Everglades marsh and the subsequent effects of habitat changes on the condition of the Everglades ecosystem are not well understood. Additional research on factors contributing to these habitat changes is critical if ecosystem restoration is to succeed. While the focus of the habitat data collection efforts in the Everglades in this study has been to characterize the habitat at marsh sampling locations and not to determine the causes of vegetation changes in the Everglades, Chapter 7.0 discusses some of the relationships between nutrients and community and species distributions within the Everglades ecosystem based on the available data. Chapter 8.0 further integrates the relationship between habitat, nutrient concentrations, and Hg concentrations in the Everglades.

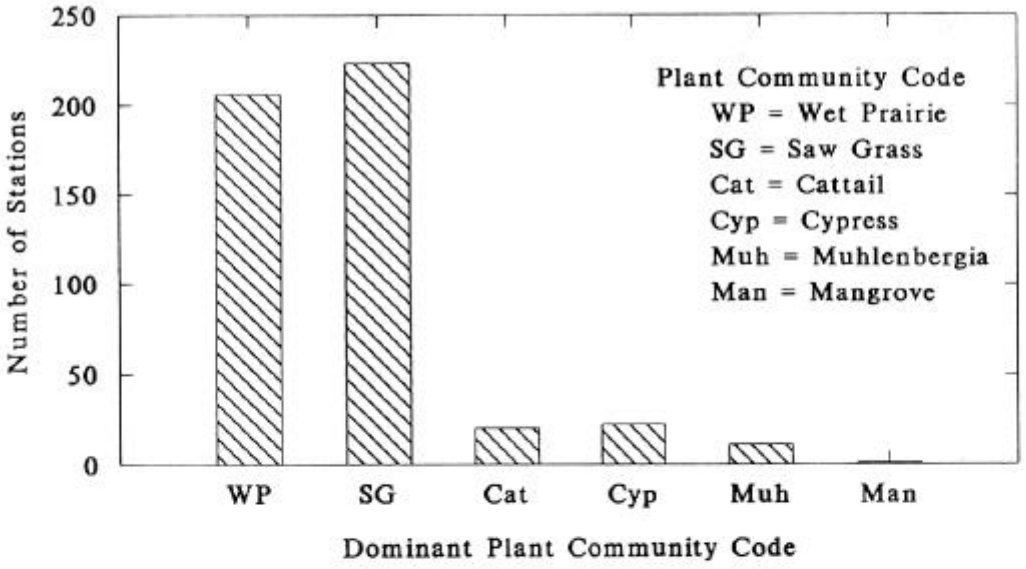

Figure 5.1 The number of marsh sampling stations occurring within each of the dominant plant communities.

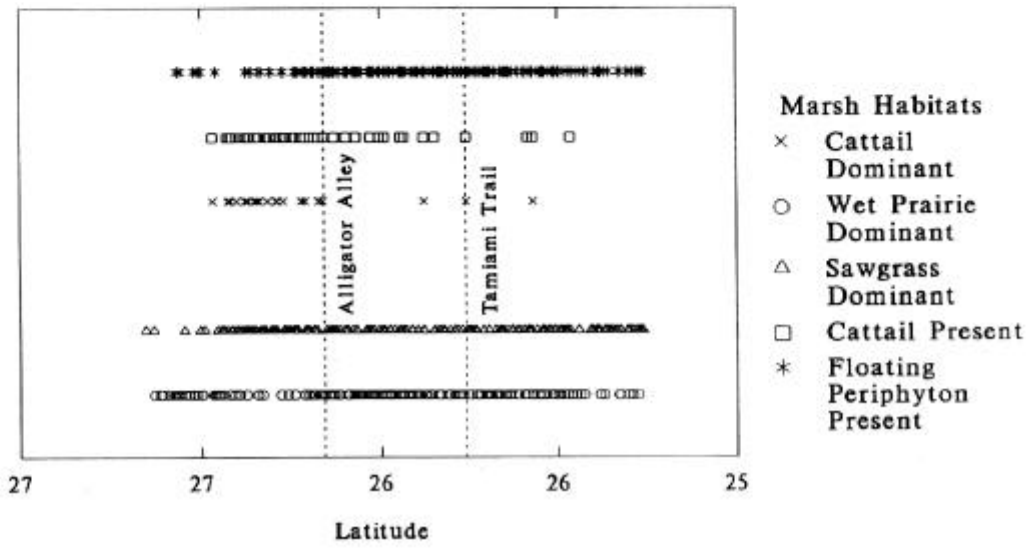

Figure 5.2 Distribution of dominant plant community classes, cattails and floating periphyton by latitude.

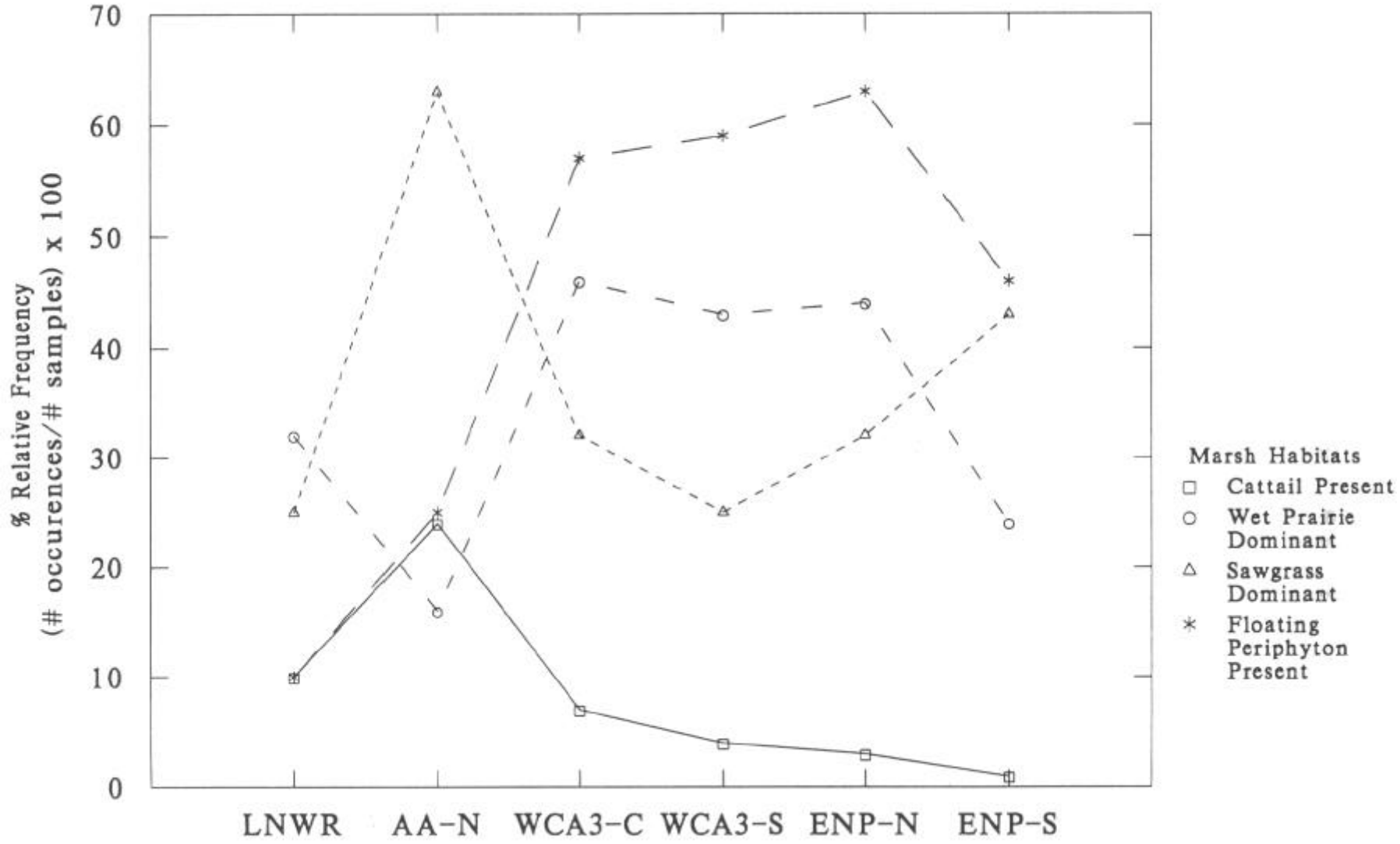

Figure 5.3 Percent relative frequency of selected plant communities, cattails, and floating periphyton in six broad latitudinal subdivisions.

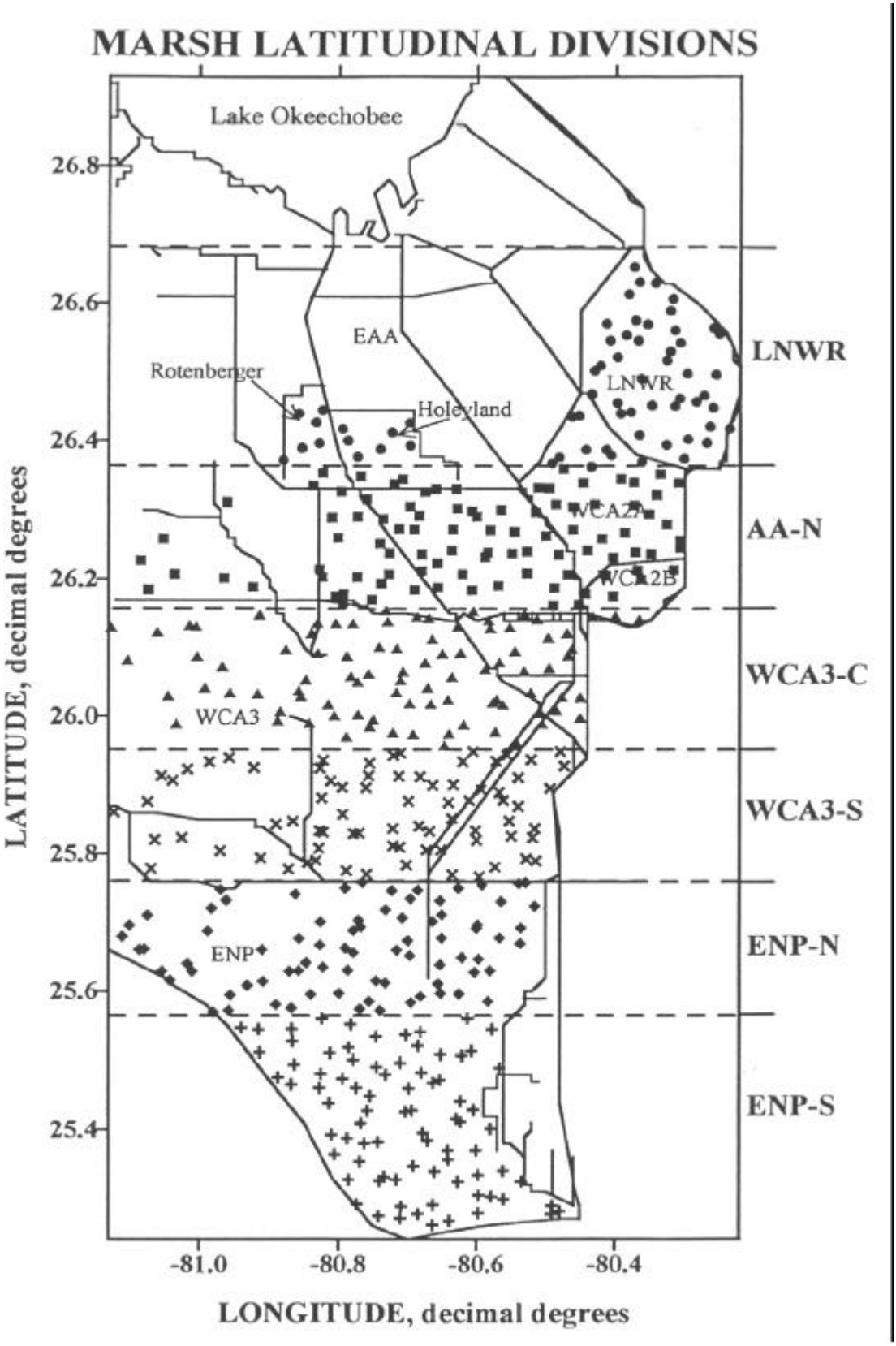

Figure 5.4 Six latitudinal subdivisions within the Everglades marsh with locations of sampling points contained in each.

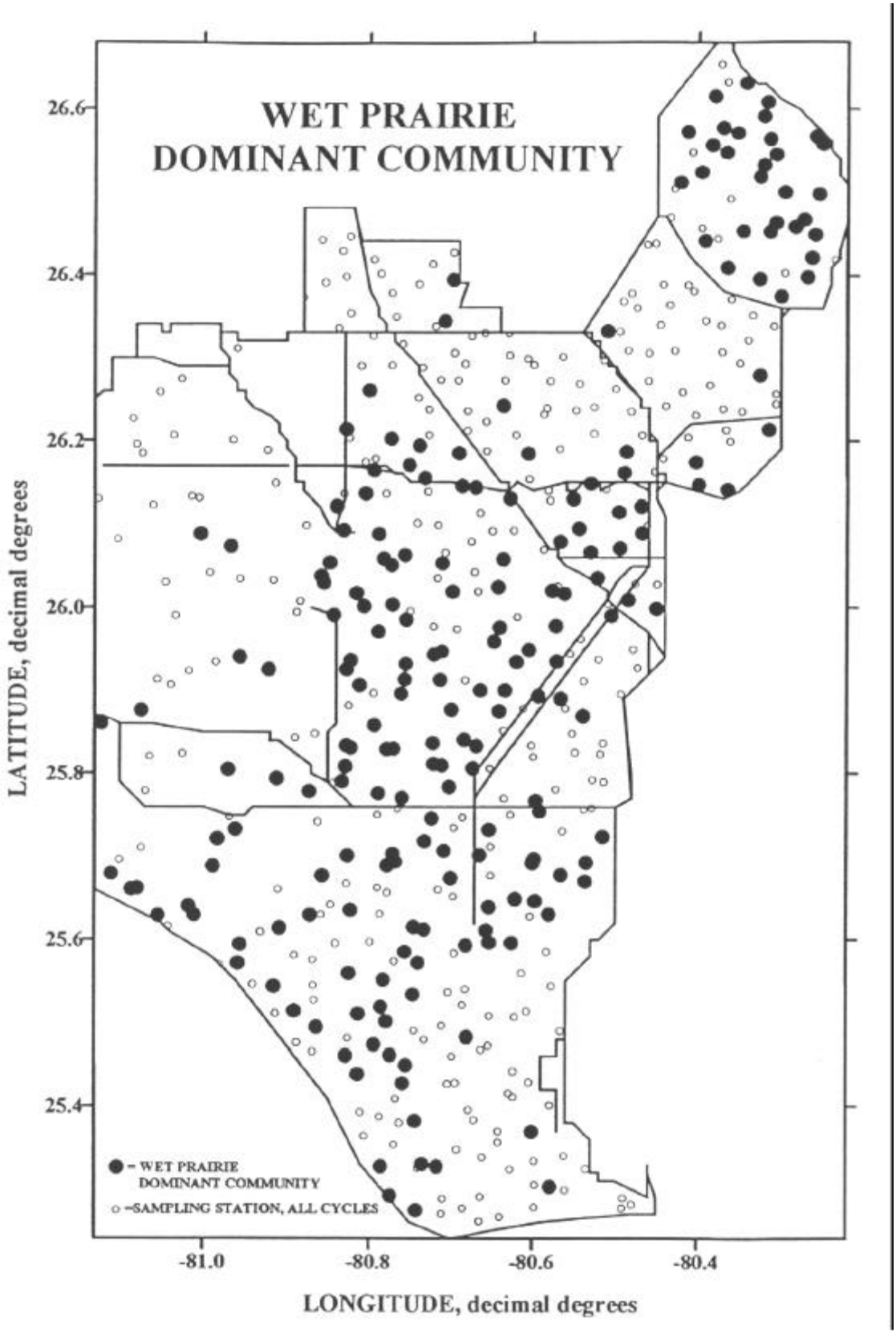

Figure 5.5 Marsh sampling sites where wet prairie was classified as the dominant plant community.

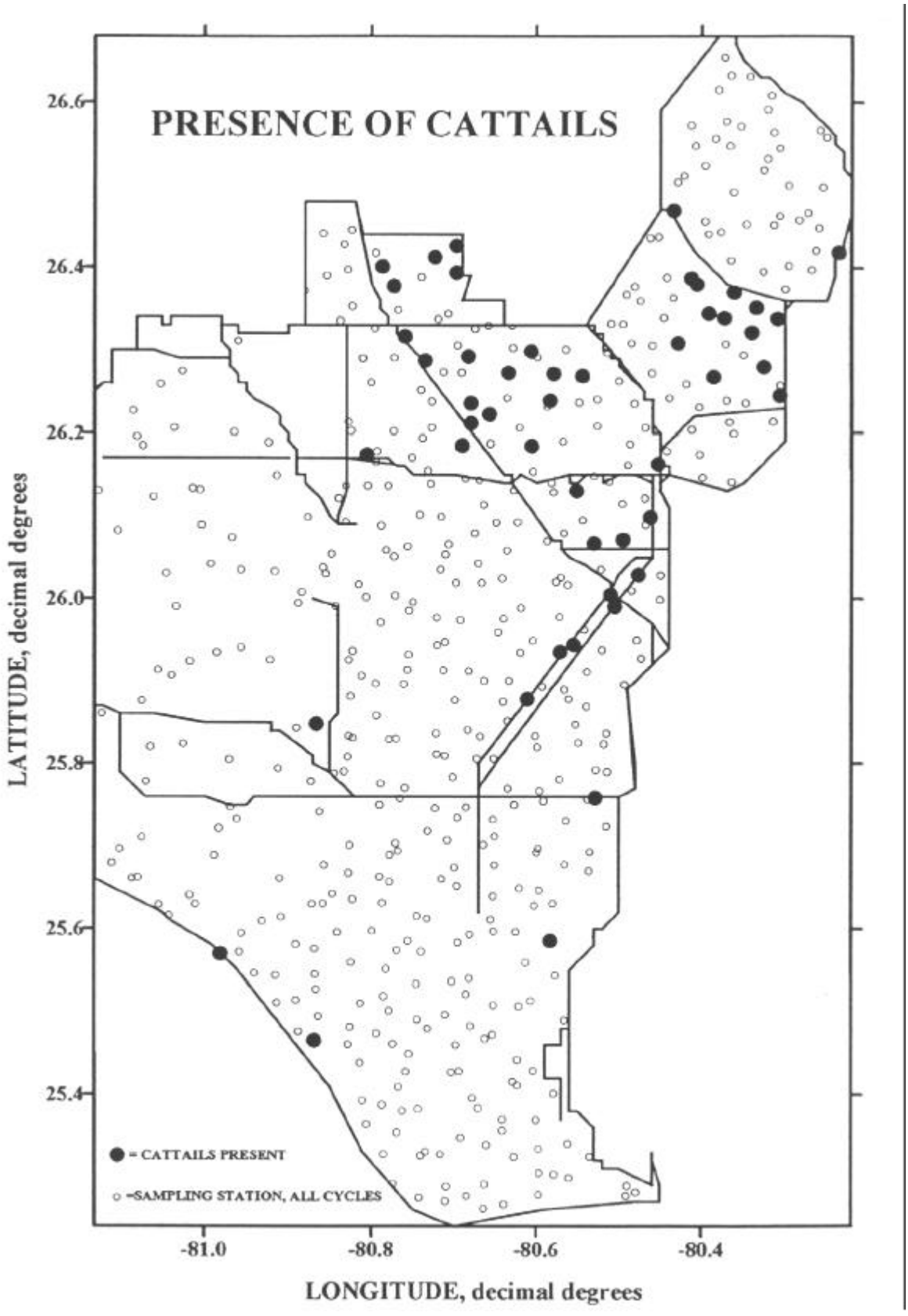

Figure 5.6 Marsh sampling stations where cattails were noted to be present during sampling.

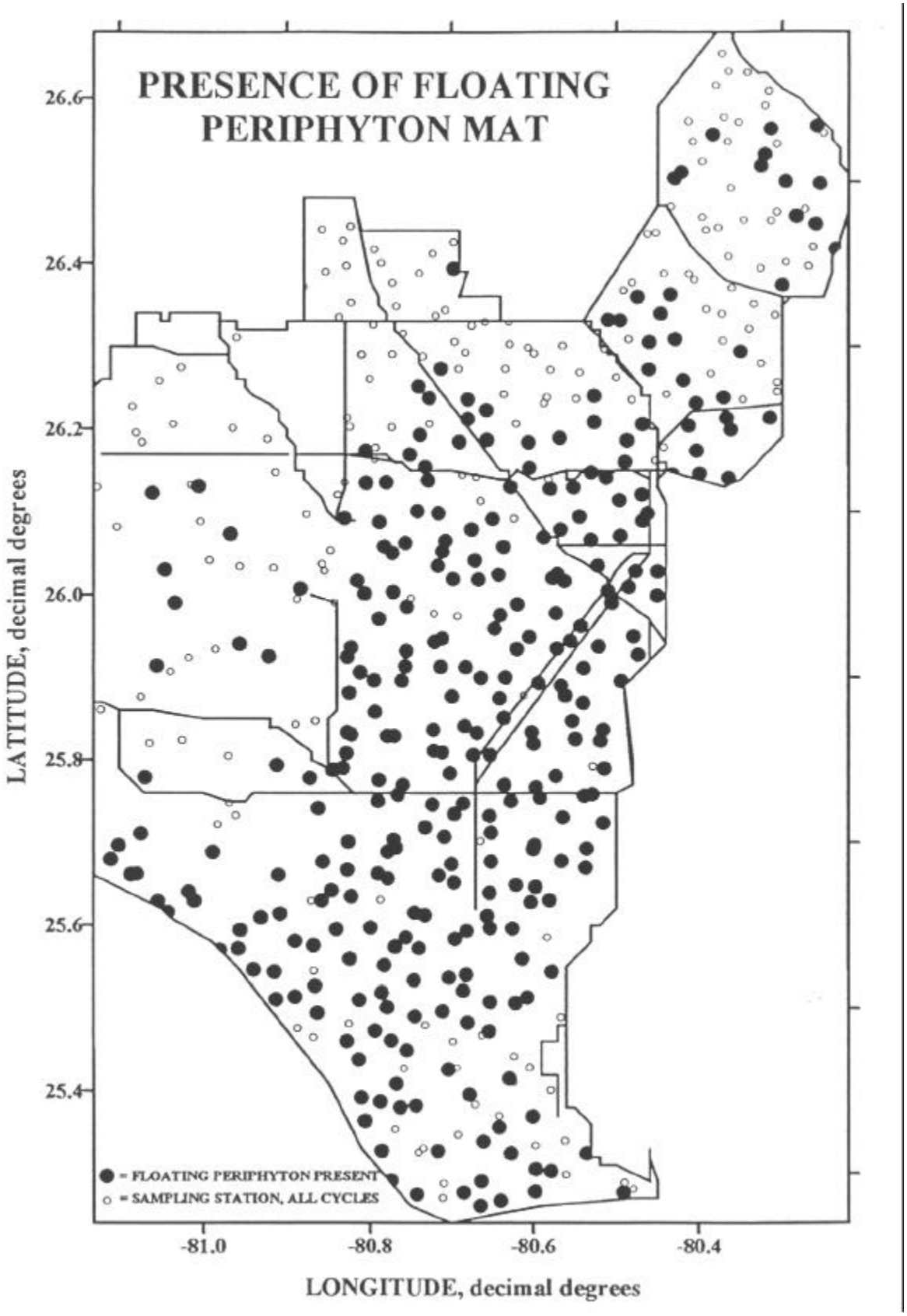

Figure 5.7 Marsh sampling stations where floating periphyton mat was present during sampling.

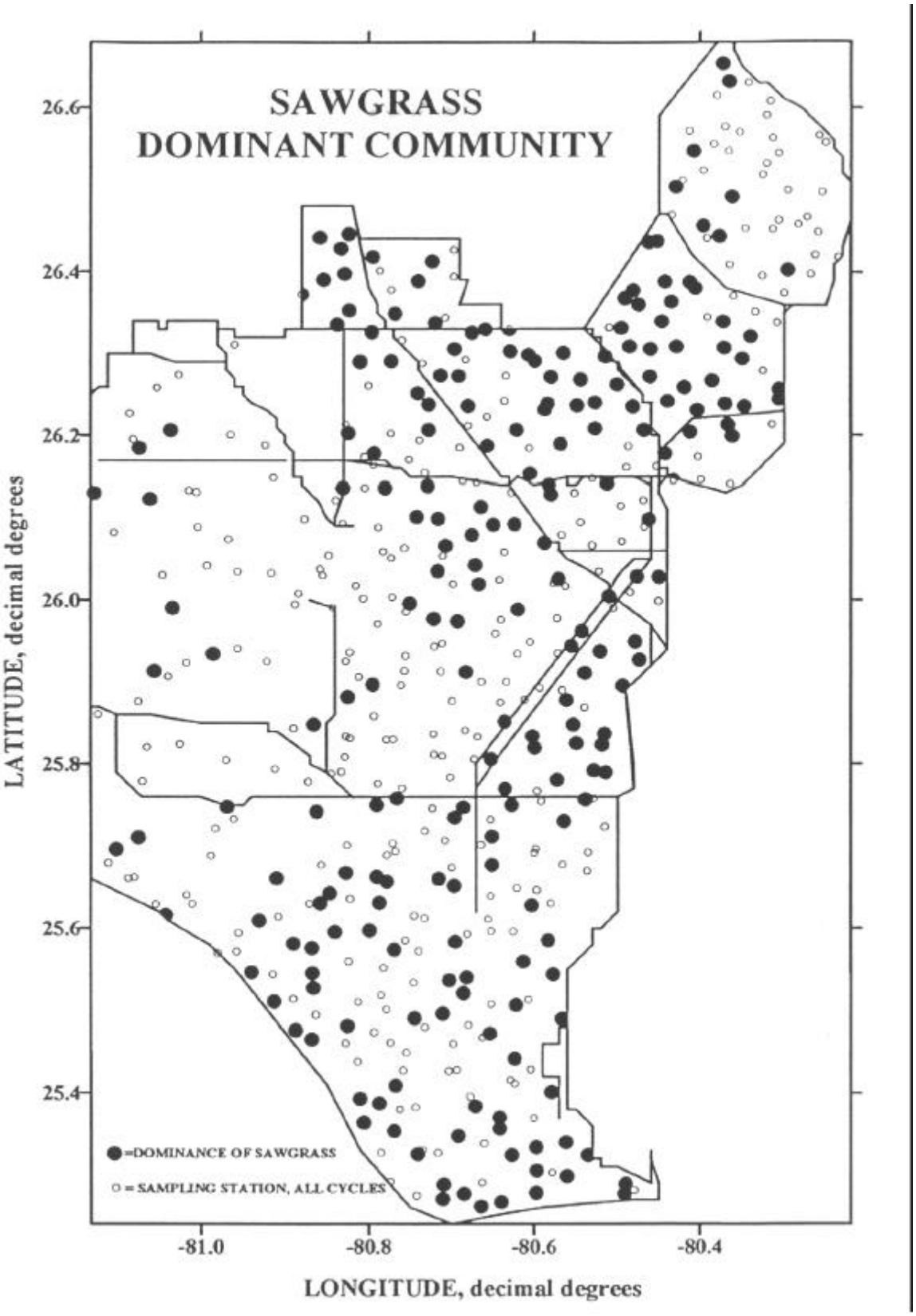

Figure 5.8 Marsh sampling stations where sawgrass was classified as the dominant plant community.