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Development of Natural Vegetation in the Lake Apopka Marsh Flow-way Demonstration Project: Phase I--Baseline Conditions, Fall 1990

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EXECUTIVE SUMMARY

The objective of this paper is to present the results of a study of the baseline vegetation conditions in the Apopka Marsh Demonstration Project. Data collected during this study will provide a pre-flooding reference point for comparison with future evaluations as the marsh develops.

For the purposes of this report, discussion of the marsh is divided into two sections--the north and south marshes. This division not only differentiates the two sites by land use history, but also separates the marshes into the inflow marsh (south marsh) and outflow marsh (north marsh). Historically, the north marsh has been farmed for the longest time (1950-1988). The south marsh has been intermittently farmed since about 1965.

A sampling grid containing permanent community and temporary biomass sampling plots was established in the fall of 1990 along a downstream gradient from the lake water inlet to the outflow pumps. Also, a 600 m transect was established from near the inlet downstream along the flow direction to provide higher resolution measurements. Sampling intensity was 0.014% of the total marsh area.

Data collected consisted of plant species composition, percentage cover, height, density, phenology, and water depth. Above-ground vegetation was clipped at ground level from one plot per sampling node. Below-ground biomass was sampled at grid points near the inlet to determine preliminary estimates of below-ground biomass averages and variation. Soil cores were collected and placed in a greenhouse under a moist soil treatment to determine the composition of the soil seed bank.

Sixty four plant species were found. Each plant species was categorized according to its wetland affinity. The categories were as follows:

- o Obligate Hydrophyte--found in wetlands > 99% of the time
- o Facultative-Wetland--usually found in wetlands 67-99% of the time
- o Facultative--found in wetlands 34-66% of the time
- o Facultative-Upland--occasionally found in wetlands 1-33% of the time
- o Upland--seldom found in wetlands < 1% of the time

The proportions of species by wetland affinities were: obligate hydrophyte (51%), facultative-wetland (24%), facultative (16%), facultative-upland (8%), and upland (2%). The north marsh was dominated by dogfennel (*Eupatorium capillifolium*) stands separated by grass and herb fringed canals. The south marsh was a complex aggregate of wetland and marginal wetland plants, including, dayflower (*Commelina diffusa*), water primrose (*Ludwigia octovalvis*), smartweed (*Polygonum punctatum*), arrowhead (*Sagittaria lancifolia*), and cattail (*Typha latifolia*). Vegetative co-dominance within both the north and south marshes was shared by six species. The occurrence of common south marsh plants in the north can be attributed to the exploitation of occasional patches and canal edges. Mean above-ground biomass estimates ranged from 191 g/m^2 to 1807 g/m^2. No strong gradient pattern along the east-west axis of the marshes was observed for total above-ground biomass. A comparison of mean biomass vs. mean cover revealed a pattern in which cover peaked at about 900 g/m^2 biomass, thus reducing the utility of mean cover as a predictor of mean biomass. Mean below-ground estimates ranged from 116 g/m^2 to 342 g/m^2. A correlation analysis revealed no relationship between above-ground and below-ground biomass. This may result from the nature of root distribution within the study area. Also, within plot variation of below-ground biomass was very high. In future studies, a larger sample size will be needed to minimize the sample variation problem.

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INTRODUCTION

Restoration of the Apopka marsh is essential for re-establishing and maintaining good water quality in Lake Apopka. Currently, concern is focused on the hypereutrophic state of Lake Apopka (Lowe et al. 1989). Conversion of marshlands to muck farms, coupled with previous and current practices related to citrus farming and wastewater disposal, contributed to water quality degradation of Lake Apopka. Conversion of Lake Apopka's peripheral marshes to farmlands not only removed the water quality enhancement function of original marsh wetlands, but also degraded water quality by increasing soil oxidation and releasing peat-bound nutrients coupled with decreased water quality of farmland runoff water. Benefits from the restoration of the Apopka marsh will include: (1) elimination of nutrient subsidies to the lake from fertilization and peat oxidation on the site, (2) development of a nutrient and carbon sink as particulate material from the lake is deposited in the marsh, and (3) restoration of wetland wildlife habitat in an area that has lost its historical wetland wildlife functions (Armentano and Menges 1986, Lowe et al. 1989).

Objectives of this research were to provide baseline vegetation data for the site and insights into marsh restoration. The baseline vegetation data provide a reference state for comparison with future evaluations as the marsh develops. The vegetation baseline data consisted of plant species composition, community structure, and biomass estimates. Arrangement of permanent sampling plots along a downstream gradient will allow detection of changes in the ecosystem resulting from the addition of nutrient-laden lake water. The effects of experimental plantings within the marsh also will be evaluated using the permanent sampling plots.

METHODS

STUDY SITE DESCRIPTION

The Apopka marsh restoration demonstration site is located on the northwest shore of Lake Apopka (Lat. 28°40'N, Long. 81°39'W). The original marsh was dominated by sawgrass prior to conversion to farmland during the 1950s. For the purposes of this report, discussion of the marsh is divided into two sections--the north and south marshes. This division not only functions to differentiate between the two sites by land use history, but also separates the marshes into the inflow marsh (south marsh) and outflow marsh (north marsh).

Historically, the north marsh has been farmed for the longest period (1950-1988). The south marsh had been intermittently farmed beginning about 1965. A lower frequency of active farming in the south marsh arose as a result of drainage characteristics during high lake levels and irrigation requirements during low lake levels (Bob Cooper, Pers. Comm.). Because of these differing land use histories and recent soil scraping, general land cover categories can be applied to each section of the marsh.

Vegetation in the north marsh was dominated by rectangular-shaped stands of tall dogfennel (*Eupatorium capillifolium*) separated by graminoid-fringed canals. The south marsh contained rectangular and spatially complex "natural" stands. The rectangular community patterns were remnants of farmed fields. The south marsh was an intricate aggregate of wetland and marginal wetland plants. This system contained a combination of species including *Commelina diffusa, Polygonum punctatum, Sagittaria lancifolia,* and *Typha latifolia.* In both the north and south marshes, areas were scraped in April 1990 to provide soil for levees and to reduce soil surface elevations to the ambient grade. In these locations plants such as *Ludwigia octovalvis, Panicum dichotomiflorum*, and *Sesbania exaltata* were common. These community types were easily differentiated using aerial photography. Soils of the Apopka marsh are mostly histosols. Sands are found occasionally along canal edges and commonly along a low levee running north to south near the western end of the north marsh. Scraped areas tended to have a compact histosol. A seemingly exceptional soil strata exists near the northeast corner of the south marsh. The soil profile in this area contains a thin, compact histosol surface layer overlaying a silt stratum.

Drought conditions existed during the year prior to sampling. Total rainfall measured at Clermont, Florida during the period Sept. 1989 through Sept. 1990 was 100 cm. This rainfall is about 1.5 standard deviations below the mean annual rainfall from 1949 to 1988 (131 cm $\pm$ 21 cm, NOAA 1990). Drought conditions may promote the expansion of upland plants into the marsh. As such, rainfall patterns may be affecting the species composition of the marsh.

SAMPLING TRANSECTS, NODES, AND PLOTS

Permanent community and temporary biomass sampling plots were established along transects in the north and south marshes (Figure 1). Transects 1 - 8 were established perpendicular to the direction of water flow along the axis of the marsh. Transect 9 was placed nearly parallel to the major water flow pattern beginning 50 m from the lake water inlet. Transects five through eight in the north marsh were located (460, 960, 1910, and 2340 meters, respectively) downstream from the flow-way inlet levee. Transect eight was located about 500 m from the outlet pumps. The distance between transects six and seven (950 m) was relatively large to ensure that transects would be located upstream and downstream of the experimental planting site #3. Each north marsh transect was 590 m long with a 50-m distance from marsh boundaries. Transects one through four in the south marsh were located (200, 600, 1200, 1700 meters, respectively) downstream from the lake water inlet. Transects two and three were placed 600 m apart to ensure placement upstream and downstream of experimental planting site #1. Transect four was placed 40 m from the western levee to ensure a transect downstream of the experimental planting site #2. Transect 9 was 600 m long. The remaining south marsh transects were 460 m long with a 50 m buffer at each end.

Along transects 1-8, eight sampling nodes were established. Transect 9 contained ten nodes. Each node was 20 m in radius (Figure 2). Each node contained three permanent community sample plots and one biomass sample plot. Node intervals for transects 1 - 4 were 50 m; intervals for transects 5 - 8 in the north marsh were 70 m. Along transect 9, nodes 1 - 7 were placed at 50 m intervals and nodes 8 - 10 were placed at 100 m intervals. The node intervals of transect 9 were chosen to provide high resolution measurements near the lake water inlet and the flexibility to easily add nodes along the transect as potential community gradients develop.

Sample plots (1 m^2) were established randomly within each node. A 2 m wide plot exclusion zone (Figure 2) was centered on the transect to avoid placing plots along the access trail. Permanent community and temporary biomass plots were established to provide long-term measurements of vegetation dynamics, phenology, and succession. Permanent plots are needed to maximize information content per sample (Loeb 1990). Biomass plots provide estimates of net production and nutrient content. Sampling intensity was 0.014% of the total marsh area.

Sampling times were (transects = $T_{1\text{-}9}$): 28 Oct 1990 (T_1, T_2 partial, and T_9), 10-11 Nov 90 (T_2 partial, T_3, T_4, and T_8), 24 Nov 1990 (T_6), 30 Nov 1990 (T_5 and T_7). Data collected from all plots consisted of the following: species composition (plant species identified), cover (percentage of total plot covered by each species), height (height of the tallest leaf), density (numbers of bunch, culm, and stem-forming species), water depth (water depth at three points, measured to nearest 0.5 cm), and phenology [relative cover (1/3, 2/3, and entire portion of canopy) of each species containing flowers, immature fruit, and mature fruit]. Botanical nomenclature follows Godfrey and Wooten (1979, 1981) for most monocots and dicots, Lakela and Long (1976) for ferns, and Radford et al. (1968) for *Solidago tortifolia*.

In addition to the measurements referenced above, all above-ground biomass was clipped at ground level from plot four. Biomass was bagged then stored at 4 °C for up to one week prior to sorting. Live biomass was sorted by species. Dead biomass was separated from live biomass and all species were pooled per node. Biomass was dried at 70 °C to constant mass, then weighed to the nearest 0.1 g.

Below-ground biomass was sampled along transects 1, 2, and 9. Transects 1, 2, and 9 were chosen to provide preliminary estimates of below-ground biomass averages and variation. Within each biomass plot, three cores (5 cm diameter X 20 cm long) were extracted, bagged, and stored at 4 °C for up to a month. Roots were extracted from soil by washing through a No. 10 (2mm mesh size) U.S. Standard Testing Sieve. Extracted roots were dried at 70 °C to a constant mass, then weighed to the nearest 0.001 g. All biomass was weighed on a Scientech 5200 electronic balance. Samples (100 g wet weight) of rootless soil were extracted and air-dried for nutrient analysis.

SEED BANK

To determine the potential marsh seed bank, soil cores (2 cm X 10 cm) were collected and placed in a greenhouse under a moist soil treatment. Ten soil cores per node from every

Figure 1. Idealized Map of Apopka Marsh Demonstration Project. Approximate Locations of Transects, Experimental Plantings, and Photopoints Shown. Not To Scale.

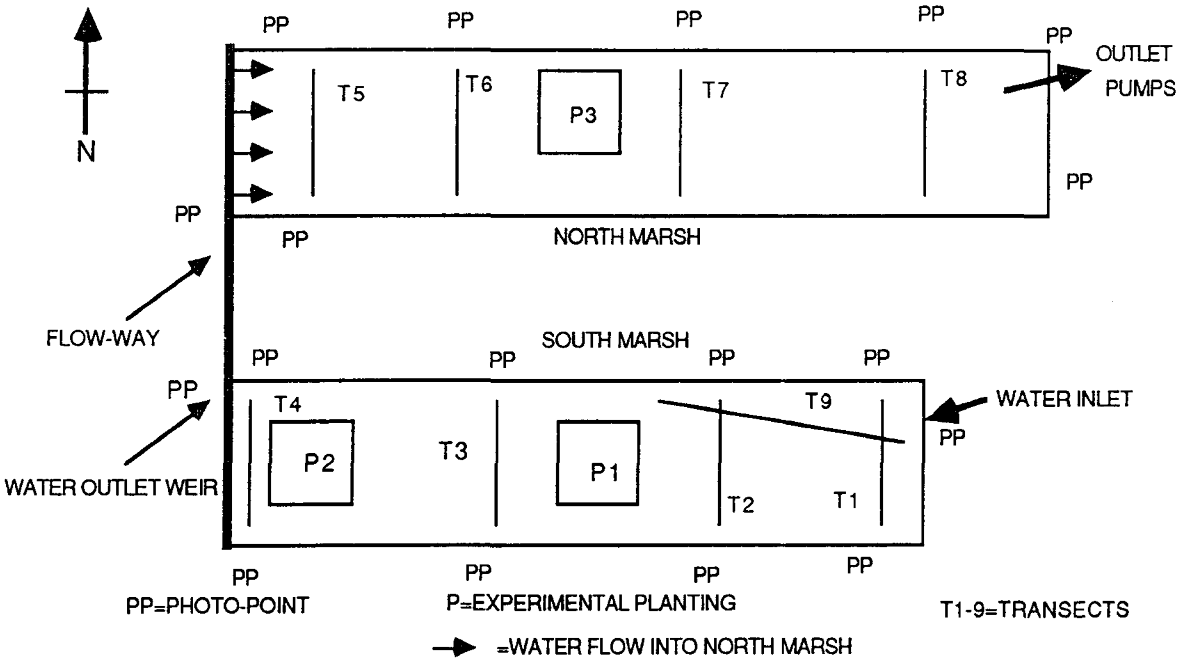
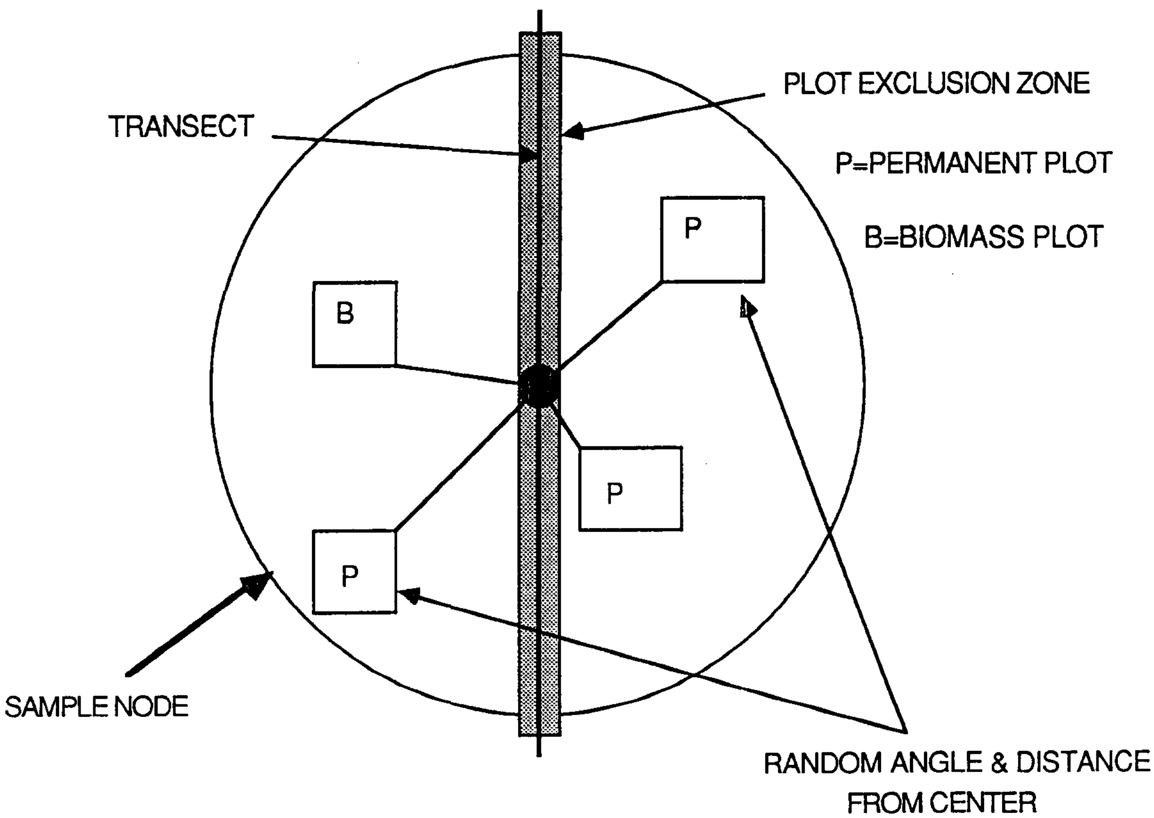


Figure 2. Plot Set-Up



other node from the first three transects of each marsh were collected. Cores were combined to provide a composite of each node sampled. In the greenhouse, soil samples from within each node were mixed and distributed among three 10.2-cm diameter plastic pots on three different benches in the greenhouse. Five pots per bench contained sterile peat soil only to provide an estimate of contamination from local seed fall. Pot position per bench was randomly assigned. Pot positions are reassigned randomly during inventory to limit effects of the greenhouse on germination. No data will be available until seedlings become large enough to identify. A photographic and herbarium catalog of seedling growth habits is being developed to allow rapid identification of young seedlings in the field and greenhouse.

COMPUTATIONAL METHODS AND STATISTICAL ANALYSIS

Numeric community descriptions per transect included plant species importance values, Sorensen's Similarity Index, Shannon-Weaver Diversity Index (Mueller-Dombois and Ellenberg 1974). A Wetland Affinity index based on Reed (1989) was also calculated. Statistics describing community structure included means and standard errors for density, height, percent cover and biomass by species per transect. Mean cover, density, height, and biomass was calculated by summing each parameter's values and dividing by the number of plots in each transect ($n=32$ for permanent and $n=8$ for biomass plots). Analysis of variance was used to test for differences between mean total biomass estimates per transect. F_{MAX} and Bartlett's Test were used to test for variance equality (Sokal and Rohlf 1981). The Student-Neuman-Keuls multiple range test was used to test for differences among aboveground biomass means (Day and Quinn 1989). A Pearson Correlation Analysis was used to test for relationships among transects, nodes, root mass, shoot mass, and root/shoot ratios (SAS 1988).

From each transect, relative cover, relative frequency, and relative biomass were calculated. From the relative cover and frequency indices, an importance value (IV) was also calculated using the equation: IV = (relative cover + relative frequency)/2
From each of these indices a weighted wetland affinity index value was determined as follows. Each plant species was assigned a wetland affinity index number ranging from 1 to 5 according to Reed (1989) as follows:

Unknown or Dead = 0 = Not used in calculations
Obligate hydrophyte (OBL: Found in wetlands > 99% of the time) = 1
Facultative-Wetland (FACW: Usually found in wetlands 67-99% of the time) = 2
Facultative (FAC: Found in wetlands 34-66% of the time, may occur in uplands) = 3
Facultative-Upland (FACU: Occasionally found in wetlands 1-33% of the time) = 4
Upland (UPL: Seldom found in wetlands <1% of the time) = 5

The assigned wetland affinity index number was then multiplied by each relative index value (relative cover, relative frequency, relative biomass, and importance value). These products were summed and divided by the sum of the relative index.

Sorensen's Similarity Index (%S) (see Monk 1967) was calculated for comparison of transects 1 through 8 as follows: **%S = 2C/(A+B)**. Where C is the number of species common to any two transects of interest A and B, B is the number of species common to transect B, and A is the number of species common to transect A. Shannon-Weaver Diversity index (H') was calculated for each transect as follows: $\mathbf{H' = -\Sigma p_i(\log_{10} p_i)}$. Where p_i is the number of species i divided by the total number of species observed. Maximum diversity (H_{MAX}) was calculated by the following: $\mathbf{H_{MAX} = \log_{10}(1/R)}$. Where R (species richness) is the number of observed species.

RESULTS
PLANT COMMUNITY STRUCTURE AND WETLAND INDEX VALUES

Plant Species Composition

Plant species richness for the entire flow-way sampling network consisted of 64 species (Table 1). The proportion of species by wetland affinities according to Reed (1989) were obligate (51%), facultative-wetland (24%), facultative (16%), facultative-upland (8%), and upland (2%). This distribution of plant species amongst wetland affinities may provide some indication of the future composition of the marsh as water depths and hydroperiods are increased.

Transect 1

Mean and relative cover estimates along transect 1 (Tables 2a and 2b) were dominated by *Polygonum punctatum* (60.5% and 62.8%, respectively) followed by *E. capillifolium* (21.6% and 22.4%, respectively). The remaining mean and relative cover values were nearly evenly distributed among the remaining 13 species. Tallest species were *E. capillifolium* (82.5 cm) and *P. punctatum* (81.3 cm), followed by *Panicum dichotomiflorum* (18.7 cm), *Sesbania exaltata* (17.3 cm), and *Alternanthera philoxeroides* (15 cm). Remaining species were relatively short with mean height values from 1.7 to 8.9 cm.

Based on relative cover, the wetland index was 2.42. Relative frequencies showed a similar pattern with *Polygonum punctatum* (36%), *Eupatorium capillifolium* (15%), and *Alternanthera philoxeroides* (13%) dominating. Based on relative frequency, the wetland index was 2.16. Based on importance values, the most dominant species was *P. punctatum* (49%), while *E. capillifolium* (18.5%) and *A. philoxeroides* (7.6%) were next most important. The wetland index, based on importance value, was 2.29 (Table 2b).

Mean above-ground biomass (Table 2c) was dominated by *P. punctatum* (462.6 g/m^2) and *E. capillifolium* (276.4 g/m^2). *E. capillifolium* contributed a major proportion of biomass in sample node four, 200 m from the north marsh edge. Relative biomass revealed three dominant species: *P. punctatum* (46.4%), *E. capillifolium* (27.7%) and dead (19.9%), and the wetland index was 2.66.

Transect 2

Mean cover dominance (Table 3a) was shared by *P. punctatum* (22.8%), *C. diffusa* (14.7%), and *Typha latifolia* (11.7%). Mean height graded from *T. latifolia* (62.2 cm), to *E. capillifolium* (49.8 cm), *P. punctatum* (36.7 cm), *P. dichotomiflorum* (20.7 cm), and *C. diffusa* (20.1 cm). Estimates of mean density provided little useful information due to dominance by mat-forming species.

Several plants shared relative cover dominance including *P. punctatum* (30.5%), *Commelina diffusa* (19.6%), *Typha latifolia* (15.7%), *Panicum dichotomiflorum* (12.5%), and *E. capillifolium* (10.2%) (Table 3b). The wetland index based on relative cover was 2.05. Based on relative frequency, dominant species were *P. punctatum* (17.3%), *T. latifolia* (14.1%), *C. diffusa* (13.6%), *E. capillifolium* (12.4%), and *P. dichotomiflorum* (11.1%). The wetland index value based on relative frequency was 2.02. Dominant species based on importance values were *P. punctatum* (23.9%), *C. diffusa* (16.6%), *T. latifolia* (15.4%), *P. dichotomiflorum* (11.8%), and *E. capillifolium* (11.3%); and the wetland index was 2.04.

Table 1. Species found in Apopka marsh transects, Fall 1990. Wetland Index from Reed (1989). * Wetland Index estimated.

SPP CODE	Binomial Nomenclature	Common Name	Wetland Category	Index Number
ACE RUB	*Acer rubrum*	Red Maple	FAC	3
ALT PHI	*Alternanthera philoxeroides*	Alligator Weed	OBL	1
AMA AUS	*Amaranthus australis*	Southern Water-Hemp	OBL	1
AST ELL	*Aster elliotii*	Elliot's Aster	OBL	1
AST SUB	*Aster subulatus*		OBL	1
AXO FUR	*Axonopus furcatus*	Carpet Grass	OBL	1
AZO CAR	*Azolla caroliniana*	Mosquito Fern	OBL	1
BAC HAL	*Baccharis halimifolia*	Sea Myrtle	FAC	3
CAL AME	*Callicarpa americana*	French Mulberry	FACU	4
CAR SPP	*Carex* spp.		FACW*	2
CHL GLA	*Chloris glauca*	Finger Grass	FACW	2
COM DIF	*Commelina diffusa*	Dayflower	FACW	2
CYN DAC	*Cynodon dactylon*	Bermuda Grass	FACU	4
CYP HAS	*Cyperus haspan*		OBL	1
CYP ODO	*Cyperus odorata (odoratus)*	Flatsedge	FACW	2
CYP SPP	*Cyperus* spp.		FACW	2
ECL ALB	*Eclipta alba*		FACW	2
ELE SPP	*Eleocharis* spp.	Spikerush	FACW*	2
ERI SPP	*Eriocaulon* spp.	Hat Pins	OBL*	1
EUP CAP	*Eupatorium capillifolium*	Dogfennel	FACU	4
EUP SER	*Eupatorium serotinum*	Dogfennel	FACW*	2
EUP SPP	*Eupatorium* spp.	Dogfennel	N.A.	N.A.
HYD SPP	*Hydrocotyle* spp.		FACU	4
HYG LAC	*Hygrophila lacustris*		OBL	1
IPO SPP	*Ipomoea* spp.	Morning Glory	FAC*	3
JUN EFF	*Juncus effusus*	Softrush	FACW	2
LEM SPP	*Lemna* spp.	Duckweed	OBL	1
LIM SPO	*Limnobium spongia*	Frog's Bit	OBL	1
LUD OCT	*Ludwigia octovalvis*		OBL	1
LUD PER	*Ludwigia peruviana*	Primrose Willow	OBL	1
LUD REP	*Ludwigia repens*		OBL	1
LUD SPP	*Ludwigia* spp.		OBL*	1
MEL COR	*Melochia corchorifolia*	Chocolate weed	FAC	3
MIK SCA	*Mikania scandens*	Climbing Hempweed	FACW	2
MOL VER	*Molluga verticillata*	Indian Chickweed	OBL	1

Table 1. cont'd.

SPP CODE	Binomial Nomenclature	Common Name	Wetland Category	Index Number
OSM REG	*Osmunda regalis*	Royal Fern	OBL	1
PAN DIC	*Panicum dichotomiflorum*		FACW	2
PAN HEM	*Panicum hemitomon*	Maidencane	OBL	1
PAN SPP	*Panicum* spp.		FACW*	2
PAS SPP	*Paspalum* spp.		FAC*	3
PAS URV	*Paspalum urvillei*		FAC	3
PEL VIR	*Peltandra virginiana*	Arrow Arum	OBL	1
PHY ANG	*Physalis angusta (angulata)*		FAC	3
POL PUN	*Polygonum punctatum*	Smartweed	FACW	2
PON COR	*Pontedaria cordata*	Pickerel Weed	OBL	1
RAN SPP	*Ranunculus* spp.		FACW*	2
RHY IND	*Rhynchospora inundata*		OBL	1
RHY SPP	*Rhynchospora* spp.		OBL	1
SAC IND	*Sacciolepis indica*		FAC	3
SAG KUR	*Sagittaria kurziana*	Spring-Tape	OBL	1
SAG LAN	*Sagittaria lancifolia*	Arrowhead	OBL	1
SAL CAR	*Salix caroliniana*	Coastal-Plain Willow	OBL	1
SAL ROT	*Salvinia rotundifolia*	Water Spangles	OBL	1
SAM CAN	*Sambucus canadensis*	Elderberry	FACW	2
SAM PAR	*Samolus parviflorus*	Water Pimpernel	OBL	1
SCI SPP	*Scirpus* spp.	Bulrushes	OBL	1
SES EXA	*Sesbania exaltata*		FAC	3
SOL SPP	*Solidago* spp.		FACU*	4
SOL TOR	*Solidago tortifolia*		UPL	5
SPI SPP	*Spirodella* spp.		OBL*	1
STA FLO	*Stachys floridana*		FAC	3
TYP LAT	*Typha latifolia*	Common Cattail	OBL	1
TYP SPP	*Typha* spp.	Cattail Seedling	OBL	1
WOL SPP	*Wolffia* spp.		OBL	1
WOLF SPP	*Wolffiella* spp.		OBL	1
<u>UNKNOWNS</u>				
CYPERACEAE		Sedge family		
POACEAE		Grass family		
FERN		unknown fern	N.A.	N.A.
UDICOT		unknown dicot	N.A.	N.A.
USEEDLING		unknown seedling	N.A.	N.A.
UVINE		unknown vine	N.A.	N.A.
UNKNOWN		unknown, usually small seedling		

*For unknown species, an appropriate Wetland Index Value was assigned based on associated species in same genera coupled with location of individual in marsh.

Table 2a. Mean and standard error for cover (%), height (cm), and density (#/m²) based on permanent and biomass plots (n=32) for Transect 1 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

	COVER		HEIGHT		DENSITY	
SPECIES	MEAN	±SE	MEAN	±SE	MEAN	±SE
ALT PHI	1.73	0.619	15.03	4.602	1.72	0.783
BAC HAL	0.78	0.639	8.44	5.931	0.03	0.031
CHL GLA	0.00	0.003	1.03	1.031	0.19	0.188
COM DIF	1.41	0.876	4.69	2.261	0.81	0.596
ECL ALB	0.01	0.004	2.00	1.394	0.06	0.043
EUP CAP	21.56	6.536	82.50	23.748	1.94	0.827
LUD OCT	0.63	0.489	7.67	4.571	0.59	0.533
MEL COR	0.00	0.003	1.56	1.563	0.03	0.031
PAN DIC	5.94	3.692	18.72	9.511	2.31	1.246
POL PUN	60.47	6.925	81.31	7.730	.	.
PON COR	0.78	0.781	3.06	3.063	.	.
SAC IND	0.48	0.469	4.34	2.427	0.09	0.052
SAG LAN	1.10	1.094	5.13	3.879	0.09	0.094
SES EXA	0.94	0.690	17.34	12.252	0.19	0.130
TYP LAT	0.47	0.345	8.91	6.245	0.06	0.063

Table 2b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 1 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	1.79	13.33	7.56
BAC HAL	3	0.81	2.67	1.74
CHL GLA	2	0.00	1.33	0.67
COM DIF	2	1.46	5.33	3.40
ECL ALB	2	0.01	2.67	1.34
EUP CAP	4	22.40	14.67	18.53
LUD OCT	1	0.65	4.00	2.33
MEL COR	3	0.00	1.33	0.67
PAN DIC	2	6.17	5.33	5.75
POL PUN	2	62.80	36.00	49.40
PON COR	1	0.81	1.33	1.07
SAC IND	3	0.49	4.00	2.25
SAG LAN	1	1.14	2.67	1.90
SES EXE	3	0.97	2.67	1.82
TYP LAT	1	0.49	2.67	1.58
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		2.42	2.16	2.29

Table 2c. Mean and standard error of above-ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], and associated wetland index value based on biomass plots (n=8) for Transect 1, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	8.32	8.306	0.83	7.14	3.99
AST SUB	1	3.60	3.600	0.36	3.57	1.97
BAC HAL	3	1.51	1.510	0.15	3.57	1.86
CHL GLA	2	1.01	1.010	0.10	3.57	1.84
COM DIF	2	3.77	3.770	0.38	3.57	1.98
ECL ALB	2	0.02	0.020	0.00	3.57	1.79
EUP CAP	4	276.40	255.770	27.70	10.71	19.21
LUD OCT	1	6.35	6.350	0.64	3.57	2.11
MEL COR	3	0.25	0.250	0.02	3.57	1.80
PAN DIC	2	23.85	23.850	2.39	3.57	2.98
POL PUN	2	462.61	151.470	46.36	25.00	35.68
SAG LAN	1	10.89	10.890	1.09	3.57	2.33
TYP LAT	1	1.11	1.110	0.11	3.57	1.84
DEAD	0	198.21	71.620	19.86	21.43	20.65
TOTAL				100.00	99.98	99.99
WETLAND INDEX VALUE				2.66		

Table 3a. Mean and standard error for cover (%), height (cm), and density ($\#/m^2$) based on permanent and biomass plots (n=32) for Transect 2 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

	COVER		HEIGHT		DENSITY	
SPECIES	MEAN	±SE	MEAN	±SE	MEAN	±SE
ALT PHI	1.57	0.792	11.22	4.335	2.06	1.091
AMA AUS	0.16	0.156	12.50	12.500	0.03	0.031
AST SUB	0.16	0.156	2.13	1.484	0.06	0.043
BAC HAL	0.16	0.156	1.88	1.875	0.03	0.031
CAR SPP	0.63	0.625	1.75	1.750	.	.
COM DIF	14.69	4.974	20.13	5.198	.	.
CYP ODO	0.94	0.652	7.91	3.776	0.34	0.248
EUP CAP	7.66	3.352	49.83	17.461	1.03	0.499
LUD OCT	0.47	0.469	5.94	5.938	0.06	0.063
LUD PER	0.94	0.938	6.56	6.563	0.03	0.031
PAN DIC	9.38	3.900	20.68	6.434	.	.
PAN SPP	0.31	0.313	3.13	3.125	.	.
POL PUN	22.81	6.144	36.69	7.998	.	.
SAC IND	3.28	1.628	12.41	4.811	.	.
TYP LAT	11.72	3.610	62.16	14.872	2.00	0.714
POACEAE	0.00	0.003	1.97	1.969	.	.

Table 3b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 2 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	2.09	7.41	4.75
AMA AUS	1	0.21	1.24	0.72
AST SUB	1	0.21	2.47	1.34
BAC HAL	3	0.21	1.24	0.72
CAR SPP	2	0.84	1.24	1.04
COM DIF	2	19.62	13.58	16.60
CYP ODO	2	1.26	4.94	3.10
EUP CAP	4	10.23	12.35	11.29
LUD OCT	1	0.63	1.24	0.93
LUD PER	1	1.25	1.24	1.24
PAN DIC	2	12.52	11.11	11.82
PAN SPP	2	0.42	1.24	0.83
POL PUN	2	30.48	17.28	23.88
SAC IND	3	4.38	7.41	5.90
TYP LAT	1	15.66	14.82	15.24
POACEAE	0	0.00	1.24	0.62
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		2.05	2.02	2.04

Mean above-ground biomass (Table 3c) was dominated by *E. capillifolium* (314.7 g/m^2) and *P. punctatum* (195 g/m^2). *E. capillifolium* was concentrated along a narrow segment (node 5) of the transect. Based on relative biomass, the following were dominant: dead (43.9%), *E. capillifolium* (24.3%), and *P. punctatum* (15.1%); and the wetland index was 2.73.

Transect 3

Mean cover (Table 4a) reflected species dominance by *P. dichotomiflorum* (40.9%) and *Ludwigia octovalvis* (16.3%). This change was associated with increased soil compaction (Stenberg, field observation, Fall 1990) in an area that was scraped to provide soil for levee construction and to reduce soil surface elevations to a specified grade. Mean height declined from *L. octovalvis* (65.9 cm), *P. dichotomiflorum* (65 cm), *E. capillifolium* (29.5 cm), *Sacciolepis indica* (19.7 cm), to the remaining species (0.78 to 9.22 cm). Mean density was dominated by *E. capillifolium* (9 ind./m^2).

The wetland index was 1.98 for transect 3; and it had two dominant species (Table 4b) based on relative cover: *P. dichotomiflorum* (49.1%) and *Ludwigia octovalvis* (19.5%). Based on relative frequency and importance value, dominants were *P. dichotomiflorum* (25.3% and 37.2%, respectively), *L. octovalvis* (17.2% and 18.3%, respectively) and *Sacciolepis indica* (14.1% and 10.4%, respectively). The wetland index values derived from relative frequency and importance value were 2.03 and 2.00, respectively.

Mean above-ground biomass (Table 4c) dominance was shared by five species: *P. dichotomiflorum* (317.1 g/m^2), *Aster subulatus* (111.1 g/m^2), *Panicum* spp. (93 g/m^2), *L. octovalvis* (75.3 g/m^2), and *E. capillifolium* (74.7 g/m^2). The remaining biomass contributed a small fraction (2%) of the total transect biomass. *E. capillifolium* and *A. subulatus* were most abundant near the southern end of the transect. Other species were more evenly distributed along the transect. The relative biomass for this transect varied from the other indices. The dominant species based on relative biomass were *P. dichotomiflorum* (38.3%), dead (17.1%), *A. subulatus* (13.4%), and *Panicum* spp. (11.2%); and the wetland index was 1.96.

Transect 4

Transect 4 was located near the western marsh boundary in an area that had recently been flooded. *P. dichotomiflorum* (29.8%) dominated the mean cover (Table 5a) along this transect. In general, mean cover per species was low and evenly distributed. Mean height dominance was shared by *L. octovalvis* (82.8 cm), *P. dichotomiflorum* (63.2 cm), and *A. subulatus* (40.3 cm). The remaining species declined in height from 14.9 cm to 0.31 cm. Mean density was dominated by *L. octovalvis* (2.5/m^2). Transect 4 had two dominant species (Table 5b) based on relative cover and frequency and importance values: *P. dichotomiflorum* (57.2%, 20.5%, and 38.8%, respectively) and *L. octovalvis* (11.7%, 19.7%, and 15.7%, respectively). Wetland indices were (1.95, 1.84, and 1.90, respectively).

Mean biomass dominance was shared by three species: *P. dichotomiflorum* (166.2 g/m^2), *A. subulatus* (141.3 g/m^2), and *Panicum* spp. (125.6 g/m^2) (Table 5c). A second level of biomass contained an unknown grass (61.8 g/m^2), *Paspalum* spp. (34.3 g/m^2), and *L. octovalvis* (24.2 g/m^2). The species producing low biomass estimates were also found less frequently. Dominance based on relative biomass was shared by *P. dichotomiflorum* (23.1%), *A. subulatus* (21.4%), *Panicum* spp. (19.0%), and an unknown grass (12.4%). The wetland index was 1.77. The wetland index may not be representative of the community since the unknown grass.

Table 3c. Mean and standard error of above ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2] and associated wetland index value based on biomass plots (n=8) for Transect 2, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	0.11	0.110	0.01	3.85	1.93
COM DIF	2	46.29	31.650	3.57	11.54	7.56
EUP CAP	4	314.71	305.790	24.28	7.69	15.99
LUD OCT	1	15.68	15.680	1.21	3.85	2.53
PAN DIC	2	50.38	50.380	3.89	3.85	3.87
PAN SPP	2	17.09	16.910	1.32	7.69	4.51
PAS SPP	3	2.53	2.530	0.20	3.85	2.03
POL PUN	2	195.04	129.230	15.05	15.38	15.22
TYP LAT	1	85.62	66.500	6.61.	11.54	9.08
DEAD	0	568.66	139.270	43.87	26.92	35.40
TOTAL				100.00	100.01	100.02
WETLAND INDEX VALUE				2.73		

Table 4a. Mean and standard error for cover (%), height (cm), and density (#/m²) based on permanent and biomass plots (n=32) for Transect 3 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

	COVER		HEIGHT		DENSITY	
SPECIES	MEAN	±SE	MEAN	±SE	MEAN	±SE
ACE RUB	0.01	0.004	0.78	0.781	0.06	0.043
ALT PHI	0.16	0.156	0.78	0.781	0.13	0.125
AST SUB	6.72	2.854	31.77	13.848	3.09	1.463
BAC HAL	0.94	0.473	4.06	4.063	0.38	0.276
CHL GLA	0.78	0.781	1.88	1.875	.	.
CYP ODO	1.10	0.433	7.41	2.979	0.38	0.167
ECL ALB	0.94	0.524	5.00	2.570	0.69	0.499
EUP CAP	7.66	3.750	29.53	13.793	8.94	5.300
LUD OCT	16.25	4.146	65.94	12.925	3.78	1.117
MIK SCA	0.78	0.455	9.22	6.492	0.13	0.087
OSM REG	0.47	0.262	3.28	2.307	0.22	0.160
PAN DIC	40.94	6.308	65.00	8.123	0.06	0.043
PAN SPP	0.00	0.003	0.63	0.625	.	.
SAC IND	5.63	1.764	19.69	4.893	0.03	0.031
SAM CAN	0.16	0.156	1.09	1.094	0.03	0.031
CYPERACEAE	0.00	0.003	.	.	.	.
USEEDLING	0.16	0.156	.	.	2.69	2.688
UNKNOWN	0.78	0.639	4.69	3.448	0.56	0.431

Table 4b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 3 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ACE RUB	3	0.01	2.02	1.01
ALT PHI	1	0.19	1.01	0.60
AST SUB	1	8.05	6.06	7.06
BAC HAL	3	1.12	4.04	2.58
CHL GLA	2	0.94	1.01	0.97
CYP ODO	2	1.32	8.08	4.70
ECL ALB	2	1.12	4.04	2.58
EUP CAP	4	9.17	5.05	7.11
LUD OCT	1	19.47	17.17	18.32
MIK SCA	2	0.94	3.03	1.98
OSM REG	1	0.56	3.03	1.80
PAN DIC	2	49.05	25.25	37.15
PAN SPP	2	0.00	1.01	0.51
SAC IND	3	6.74	14.14	10.44
SAM CAN	2	0.19	1.01	0.60
CYPERACEAE	0	0.00	1.01	0.51
USEEDLING	0	0.19	1.01	0.60
UNKNOWN	0	0.94	2.02	1.48
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		1.98	2.03	2.00

Table 4c. Mean and standard error of above ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], and associated wetland index value based on biomass plots (n=8) for Transect 3, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
AST SUB	1	111.14	106.570	13.42	8.57	11.00
BAC HAL	3	0.22	0.220	0.03	2.86	1.45
CHL GLA	2	3.01	2.920	0.36	5.71	3.04
CYP ODO	2	0.052	0.050	0.01	2.86	1.44
CYP SPP	2	0.22	0.210	0.03	5.71	2.87
EUP CAP	4	74.68	74.680	9.02	2.86	5.94
EUP SER	2	1.82	1.820	0.22	2.86	1.54
LUD OCT	1	74.41	36.200	9.12	14.29	11.71
MOL VER	1	0.01	0.010	0.00	2.86	1.43
OSM REG	1	0.01	0.010	0.00	2.86	1.43
PAN DIC	2	317.07	163.640	38.30	14.29	26.30
PAN SPP	2	93.00	49.770	11.23	11.43	11.33
PAS SPP	2	0.14	0.110	0.02	5.71	2.87
SAC IND	3	9.62	9.620	1.16	2.86	2.01
UNKNOWN	0	0.01	0.010	0.00	2.86	1.43
DEAD	0	141.46	55.990	17.09	11.43	14.26
TOTAL				100.00	100.02	100.02
WETLAND INDEX VALUE				1.96		

Table 5a. Mean and standard error for cover (%), height (cm), and density (#/m^2) based on permanent and biomass plots (n=32) for Transect 4 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

SPECIES	COVER MEAN	COVER ±SE	HEIGHT MEAN	HEIGHT ±SE	DENSITY MEAN	DENSITY ±SE
AMA AUS	0.17	0.156	14.28	9.872	0.19	0.158
AST SUB	4.54	1.815	40.25	10.570	0.97	0.337
BAC HAL	0.31	0.313	2.63	2.625	0.06	0.063
CHL GLA	0.16	0.156	2.11	1.508	0.31	0.313
COM DIF	0.47	0.262	2.66	1.569	.	.
CYN DAC	3.13	2.968	6.13	3.120	.	.
CYP HAS	1.09	0.801	3.84	2.251	1.09	0.769
CYP SPP	0.01	0.006	4.69	2.426	0.25	0.127
ECL ALB	1.09	1.094	4.75	4.750	.	.
EUP CAP	0.32	0.312	14.91	9.318	0.25	0.127
HYG LAC	0.17	0.156	3.34	1.614	0.53	0.411
LUD OCT	6.11	1.301	82.84	15.124	2.47	0.571
LUD SPP	0.00	0.003	0.31	0.313	0.09	0.094
MEL COR	.	.	1.16	1.156	0.03	0.031
PAN DIC	29.79	6.390	63.16	9.347	.	.
PAN SPP	0.01	0.004	1.78	1.241	0.06	0.043
PAS SPP	2.05	1.876	9.81	3.754	0.28	0.121
PAS URV	0.31	0.313	3.75	3.750	0.03	0.031
PHY ANG	0.64	0.625	4.00	1.753	0.31	0.138
SAM CAN	0.16	0.156	2.53	2.531	0.03	0.031
SAM PAR	0.63	0.435	1.44	1.079	0.09	0.094
TYP LAT	0.01	0.005	5.84	4.075	0.13	0.098
POACEAE	0.78	0.507	3.72	2.221	.	.
CYPERACEAE	0.16	0.156	1.25	1.250	0.09	0.094

Table 5b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 4 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
AMA AUS	1	0.32	3.42	1.87
AST SUB	1	8.71	9.40	9.06
BAC HAL	3	0.60	0.86	0.73
CHL GLA	2	0.31	1.71	1.01
COM DIF	2	0.90	2.56	1.73
CYN DAC	4	6.01	3.42	4.71
CYP HAS	1	2.10	2.56	2.33
CYP SPP	2	0.02	3.42	1.72
ECL ALB	2	2.10	0.86	1.48
EUP CAP	4	0.62	3.42	2.02
HYG LAC	1	0.32	3.42	1.87
LUD OCT	1	11.73	19.66	15.69
LUD SPP	1	0.01	0.86	0.43
MEL COR	3	0.00	0.86	0.43
PAN DIC	2	57.17	20.51	38.84
PAN SPP	2	0.01	1.71	0.86
PAS SPP	3	3.93	6.84	5.39
PAS URV	3	0.60	0.86	0.73
PHY ANG	3	1.23	5.13	3.18
SAM CAN	2	0.30	0.86	0.58
SAM PAR	1	1.20	1.71	1.45
TYP LAT	1	0.02	2.56	1.29
CYPERACEAE	0	0.30	0.86	0.58
POACEAE	0	1.50	2.56	2.03
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		1.95	1.84	1.90

Table 5c. Mean and standard error of above ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], and associated wetland index value based on biomass plots (n=8) for Transect 4, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
AMA AUS	1	1.23	1.230	0.19	3.45	1.82
AST SUB	1	141.32	97.900	21.38	10.34	15.86
COM DIF	2	3.79	3.600	0.57	6.90	3.74
CYN DAC	4	6.47	6.470	0.98	3.45	2.22
CYP HAS	1	3.93	3.930	0.59	3.45	2.02
LUD OCT	1	24.18	16.950	3.66	20.69	12.18
PAN DIC	2	166.15	100.590	25.13	17.24	21.19
PAN SPP	2	125.55	84.430	18.99	6.90	12.95
PAS SPP	3	34.30	34.300	5.19	3.45	4.38
PHY ANG	3	0.12	0.120	0.02	3.45	1.74
SAC IND	3	7.79	7.790	1.18	3.45	2.32
TYP LAT	1	2.62	2.620	0.40	3.45	1.93
POACEAE	0	61.76	61.760	9.34	3.45	6.40
DEAD	0	81.85	68.660	12.38	10.34	11.36
TOTAL				100.00	100.01	100.00
WETLAND INDEX VALUE				1.77		

(wetland index factor = 0) and the *Panicum* spp. (wetland index factor = 2) shared dominance with two known species.

Transect 5

Transect 5 was located along a slightly elevated levee. In terms of species composition, transect 5 was a microcosm of the entire south marsh. It contained a diversity of communities split between wet to the east and dry to the west of the transect. Finally, it ended in an area that was scraped to reduce soil surface elevation. The scraped area supported a community common to other scraped sites, dominated by *Sesbania exaltata* and *P. dichotomiflorum*.

Mean cover dominance by *E. capillifolium* (31.3%) and *C. diffusa* (12.8%) (Table 6a). The remaining mean cover estimates were roughly evenly distributed. Mean height was dominated by *E. capillifolium* (110.1 cm), followed by *L. octovalvis* (49.5 cm), *A. subulatus* (30.3 cm), *Callicarpa americana* (14.9 cm), *Paspalum* spp. (14.6 cm), and *C. diffusa* (12.7 cm). Mean density was dominated by *E. capillifolium* (11.3/m^2).

Dominant species (Table 6b) based on relative cover were *E. capillifolium* (44%) and *C. diffusa* (18.1%). The wetland index was 2.77. This was the first transect to have *E. capillifolium*, a facultative-upland species (wetlands index value = 4), as the most dominant species. Based on relative frequency, *E. capillifolium* (17.4%), *L. octovalvis* (14.0%), and *C. diffusa* (13.2%) were dominant. The wetland index value was 2.30. Dominance based on importance values was shared by *E. capillifolium* (30.7%), *C. diffusa* (15.6%), and *L. octovalvis* (10.3%). The wetland index was 2.54.

Mean biomass (Table 6c) was dominated by *E. capillifolium* (153.7 g/m^2). A second level of biomass dominance was shared by *A. subulatus* (41.9 g/m^2), *Panicum* spp. (28.6 g/m^2), and *P. dichotomiflorum* (14 g/m^2). The dominant groups based on relative biomass were *E. capillifolium* (49.5%), *A. subulatus* (13.5%) and, dead (12.8%). The wetland index was 2.96.

Transect 6

Mean cover, height, and density were dominated strongly by *E. capillifolium* (75%, 251.1 cm, and 52 stems/m^2, respectively). Low mean cover values for *C. diffusa* (12%) and *P. punctatum* (8.6%) reflected the presence of *E. capillifolium* free patches (Table 7a). These and the remainder of the plants along transect 6 were relatively rare under the *E. capillifolium* canopy and common along canal edges. Mean height dominance declined from *Baccharis halimifolia* (31.2 cm), to *A. subulatus* (24.1 cm), *Eupatorium* spp. (21.9 cm), *C. americana* (15.3 cm), *C. diffusa* (15.2 cm), and *P. punctatum* (15.1 cm).

Relative cover and frequency and importance values were dominated by *E. capillifolium* (61.8%, 28.2%, and 44.9, respectively) (Table 7b). *Baccharis halimifolia* had a relative frequency of 14.9%. The wetland indices based on relative cover and frequency and importance values were 3.28, 2.70, and 2.99, respectively.

Mean and relative biomass indicated dominance by *E. capillifolium* (1152 g/m^2 and 79.9%, respectively) (Table 7c). The wetland index based on relative biomass was 3.68.

Transect 7

Mean cover (73%) and height (168.8 cm) were dominated by *E. capillifolium* (Table 8a). A small understory species *Molluga verticillata* dominated mean density estimates (86 stems/m^2).

Table 6a. Mean and standard error for cover (%), height (cm), and density (#/m²) based on permanent and biomass plots (n=32) for Transect 5 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

	COVER		HEIGHT		DENSITY	
SPECIES	MEAN	±SE	MEAN	±SE	MEAN	±SE
ALT PHI	0.94	0.652	2.06	1.160	.	.
AST ELL	0.94	0.938	7.50	7.500	.	.
AST SUB	5.17	2.670	30.28	11.229	0.44	0.190
BAC HAL	0.01	0.006	6.19	2.644	0.19	0.083
CAL AME	0.17	0.156	14.88	7.324	1.91	1.716
COM DIF	12.83	4.180	12.66	3.016	.	.
CYP SPP	2.03	1.876	2.53	1.419	.	.
ECL ALB	2.03	1.617	1.16	0.807	.	.
EUP CAP	31.25	6.588	110.13	16.929	11.25	2.913
HYD SPP	0.47	0.469	0.47	0.469	.	.
IPO SPP	0.00	0.003	0.16	0.156	0.31	0.313
JUN EFF	0.16	0.156	2.63	2.625	0.03	0.031
LUD OCT	4.55	1.329	49.49	12.727	2.55	0.698
LUD REP	0.01	0.005	0.72	0.480	.	.
MOL VER	0.00	0.003	0.28	0.281	0.06	0.063
PAN DIC	4.69	2.758	7.00	3.107	.	.
PAN SPP	.	.	.	.	1.09	1.094
PAS SPP	2.51	1.587	14.63	5.799	0.41	0.167
PHY ANG	0.16	0.156	1.25	1.250	0.06	0.063
RAN SPP	0.00	0.003	0.38	0.375	.	.
SAM CAN	1.56	1.563	8.44	8.438	0.06	0.063
SES EXA	0.94	0.938	8.44	8.438	0.16	0.156
SOL SPP	0.00	0.003	1.25	1.250	0.03	0.031
TYP LAT	0.00	0.003	3.28	3.281	0.06	0.063
UVINE	0.00	0.003	.	.	0.03	0.031
UDICOT	0.48	0.469	0.13	0.125	0.78	0.781
UNKNOWN	0.01	0.004	0.22	0.166	0.06	0.043

Table 6b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 5 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	1.32	2.48	1.90
AST ELL	1	1.32	0.83	1.07
AST SUB	1	7.27	8.26	7.77
BAC HAL	3	0.02	4.13	2.08
CAL AME	4	0.24	4.96	2.60
COM DIF	2	18.05	13.22	15.64
CYP SPP	2	2.86	2.48	2.67
ECL ALB	2	2.86	2.48	2.67
EUP CAP	4	43.97	17.36	30.67
HYD SPP	1	0.66	1.65	1.16
IPO SPP	3	0.00	0.83	0.42
JUN EFF	2	0.22	0.83	0.52
LUD OCT	1	6.61	14.05	10.33
LUD REP	1	0.01	2.48	1.25
MOL VER	1	0.00	0.83	0.42
PAN DIC	2	6.61	5.79	6.20
PAN SPP	2	0.00	0.83	0.41
PAS SPP	3	3.53	6.61	5.07
PHY ANG	3	0.22	0.83	0.52
RAN SPP	2	0.00	0.83	0.42
SAM CAN	2	2.20	0.83	1.51
SES EXA	3	1.32	0.83	1.07
SOL SPP	4	0.00	0.83	0.42
TYP LAT	1	0.00	0.83	0.42
UVINE	0	0.00	0.83	0.42
UDICOT	0	0.67	2.48	1.57
UNKNOWN	0	0.01	1.65	0.83
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		2.77	2.30	2.54

Table 6c. Mean and standard error of above ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], associated wetland index value based on biomass plots (n=8) for Transect 5, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	8.76	8.760	2.82	3.05	2.94
AST SUB	1	41.85	27.340	13.49	9.16	11.32
BAC HAL	3	0.77	0.620	0.25	6.11	3.18
CAL AME	4	1.87	1.870	0.60	3.05	1.83
COM DIF	2	3.83	1.910	1.23	12.21	6.72
CYP ODO	2	.74	.740	1.88	3.05	1.65
ECL ALB	2	5.85	3.120	1.89	12.21	7.05
EUP CAP	4	153.69	89.490	49.53	15.26	32.40
EUP SER	2	2.23	2.230	0.72	3.05	1.89
LUD OCT	1	3.22	1.670	1.04	15.26	8.15
LUD REP	1	0.40	0.400	0.13	3.05	1.59
PAN DIC	2	14.02	11.430	4.52	9.16	6.84
PAN SPP	2	28.63	28.630	9.23	3.05	6.14
PAS URV	3	3.13	2.060	1.01	6.11	3.56
PAS SPP	3	0.11	0.110	0.04	3.05	1.54
SAM PAR	2	0.25	0.200	0.08	6.11	3.09
TYP LAT	1	1.11	1.110	0.36	3.05	1.71
DEAD	0	39.85	17.560	12.84	12.21	12.53
TOTAL				100.00	100.00	100.01
WETLAND INDEX VALUE				2.96		

Table 7a. Mean and standard error for cover (%), height (cm), and density (#/m²) based on permanent and biomass plots (n=32) for Transect 6 of Apopka marsh, Fall 1990. Means and standard errors are based on n = 32. A period (.) represents missing data or irrelevant data.

	COVER		HEIGHT		DENSITY	
SPECIES	MEAN	±SE	MEAN	±SE	MEAN	±SE
ACE RUB	0.00	0.003	0.63	0.625	0.03	0.031
ALT PHI	1.41	0.876	4.03	2.251	0.09	0.069
AST SUB	1.56	0.792	24.06	12.064	0.22	0.117
BAC HAL	2.57	0.629	31.19	5.794	1.78	0.375
CAL AME	4.53	2.304	15.31	7.364	1.25	0.770
COM DIF	12.03	4.139	15.16	4.451	0.06	0.063
CYP ODO	0.16	0.156	1.69	1.688	.	.
CYP SPP	1.72	1.565	2.81	2.509	.	.
ECL ALB	1.73	0.658	12.53	4.193	0.28	0.112
ELE SPP	1.56	1.259	0.28	0.281	.	.
EUP CAP	75.00	6.073	251.06	14.494	52.27	10.174
EUP SER	0.16	0.156	2.81	2.813	0.03	0.031
EUP SPP	0.78	0.507	21.88	12.259	0.25	0.142
HYD SPP	2.34	1.384	3.31	1.694	0.69	0.511
LUD OCT	0.78	0.781	3.31	3.313	0.03	0.031
PAN DIC	6.09	3.165	7.25	4.719	.	.
POL PUN	8.59	3.472	15.06	6.026	.	.
PON COR	0.63	0.625	2.97	2.969	0.03	0.031
SAC IND	1.09	0.832	5.63	4.305	.	.
FERN	0.00	0.003	0.31	0.313	0.06	0.063
UDICOT	0.16	0.156	0.16	0.156	0.63	0.625

Table 7b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 6 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ACE RUB	3	0.00	0.88	0.44
ALT PHI	1	1.13	3.51	2.32
AST SUB	1	1.25	3.51	2.38
BAC HAL	3	2.05	14.91	8.48
CAL AME	4	3.62	3.51	3.56
COM DIF	2	9.61	8.77	9.19
CYP ODO	2	0.13	0.88	0.50
CYP SPP	2	1.37	1.75	1.56
ECL ALB	2	1.38	7.90	4.64
ELE SPP	2	1.25	2.63	1.94
EUP CAP	4	61.75	28.07	44.91
EUP SER	2	0.13	0.88	0.50
EUP SPP	2	0.63	3.51	2.07
HYD SPP	1	1.87	3.51	2.69
LUD OCT	1	0.62	0.88	0.75
PAN DIC	2	4.87	4.39	4.63
POL PUN	2	6.86	6.14	6.50
PON COR	1	0.50	0.88	0.69
SAC IND	3	0.87	1.75	1.31
FERN	0	0.00	0.88	0.44
UDICOT	0	0.12	0.88	0.50
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		3.28	2.70	2.99

Table 7c. Mean and standard error of above ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], and associated wetland index value based on biomass plots (n=8) for Transect 6, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
AST SUB	1	21.82	21.820	1.51	3.70	2.61
BAC HAL	3	0.97	0.620	0.07	7.41	3.74
COM DIF	2	62.78	44.180	4.34	7.41	5.87
CYP SPP	2	2.82	2.820	0.19	3.70	1.95
ECL ALB	2	3.29	2.160	0.23	11.11	5.67
EUP CAP	4	1152.01	257.410	79.60	29.63	54.62
EUP SER	2	0.29	0.290	0.02	3.70	1.86
HYD SPP	1	0.59	0.590	0.04	3.70	1.87
LUD OCT	1	0.56	0.570	0.04	3.70	1.87
PAN DIC	2	59.79	59.790	4.13	3.70	3.92
POL PUN	2	36.44	24.330	2.53	11.11	6.81
SAC IND	3	50.61	50.610	3.51	3.70	3.60
DEAD	0	55.30	51.390	3.82	7.41	5.61
TOTAL				100.00	100.01	100.01
WETLAND INDEX VALUE				3.68		

Table 8a. Mean and standard error for cover (%), height (cm), and density (#/m²) based on permanent and biomass plots (n=32) for Transect 7 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

SPECIES	COVER		HEIGHT		DENSITY	
	MEAN	±SE	MEAN	±SE	MEAN	±SE
ALT PHI	0.16	0.156	0.78	0.455	0.16	0.102
AST SUB	1.09	0.434	11.78	6.260	0.22	0.087
BAC HAL	8.45	2.688	45.28	7.096	4.34	0.912
COM DIF	3.75	2.936	1.34	0.937	.	.
CYP HAS	0.01	0.004	3.59	2.918	0.16	0.128
CYP ODO	0.32	0.312	2.91	1.864	0.06	0.063
CYP SPP	0.01	0.004	1.41	1.175	0.06	0.063
ELE SPP	0.00	0.003	0.13	0.125	.	.
ERI SPP	0.31	0.313	1.75	1.750	0.03	0.031
EUP CAP	72.97	6.201	168.79	19.056	40.44	7.607
HYD SPP	0.48	0.261	1.06	0.462	0.72	0.368
LUD OCT	0.32	0.217	1.84	0.979	0.28	0.157
MOL VER	3.15	1.432	3.69	1.043	86.38	63.083
PAN DIC	5.47	3.264	10.66	4.868	.	.
RAN SPP	0.95	0.791	3.39	3.119	1.47	1.253
SAC IND	5.33	2.243	13.50	3.285	1.28	0.734
SAL CAR	5.63	3.228	24.53	12.052	0.53	0.280
TYP LAT	3.13	3.125	7.81	7.813	0.84	0.844
CYPERACEAE	0.00	0.003	1.69	1.688	.	.
UDICOT	0.00	0.003	0.06	0.063	0.31	0.313

Relative cover was dominated by *E. capillifolium* (65.4%) (Table 8b); and the wetland index was 3.30. Dominance based on relative frequency was shared by *E. capillifolium* (21.2%), *B. halimifolia* (17.4%), and *S. indica* (12.2%). The wetland index value was 2.39. There were two dominant species based on importance values: *E. capillifolium* (43.3%) and *B. halimifolia* (12.5%). The wetland index value was 2.85.

Mean and relative biomass was dominated by *E. capillifolium* (927.4 g/m^2 and 79.0%, respectively) (Table 8c). The mean biomass estimate for *P. dichotomiflorum* (142 g/m^2) reflected its dominance along some of the canal edges. *Salix caroliniana*, although a relatively important species in terms of biomass (66.6 g/m^2), was only found near the northern end of the transect. Based on relative biomass, the wetland index was 3.56.

Transect 8

Mean cover, density, and height were dominated by *E. capillifolium* (70.5%, 200.2 cm, and 75.3/m^2, respectively) (Table 9a).

Relative cover was also dominated by *E. capillifolium* (79.3%) (Table 9b). The wetland index was 3.56. Relative frequency importance was shared by *E. capillifolium* (33.8%), *B. halimifolia* (15%), and *A. subulatus* (10%). The wetland index was 2.83. The importance value revealed one dominant species, *E. capillifolium* (56%) with a wetland index of 3.20.

Mean and relative biomass were dominated by *E. capillifolium* (1628 g/m^2 and 90%, respectively) (Table 9c). The wetland index, based on relative biomass, was 3.85.

Transect 9

Mean cover was dominated by *P. punctatum* (22.7%), *C. diffusa* (11.3%), and *P. dichotomiflorum* (6.7%). Mean height was dominated by a suite of species including *P. dichotomiflorum* (30.1 cm), *C. diffusa* (29.1 cm), *A. philoxeroides* (28.3 cm), *Sesbania exaltata* (26.7 cm), and *Paspalum* spp. (22.4 cm). Since mat-forming plant species are common along this transect, density estimates were low and not meaningful at this time (Table 10a).

Relative cover was dominated by *P. punctatum* (38.8%), *C. diffusa* (19.3%), and *P. dichotomiflorum* (11.5%); the wetland index was 1.85. Relative frequency was shared by *P. punctatum* (16.9%), *A. philoxeroides* (12.9%), and *C. diffusa* (12.9%); the wetland index was 1.73. Dominance based on importance value was shared by *P. punctatum* (27.9%), *C. diffusa* (16.1%), *A. philoxeroides* (11.1%), and *P. dichotomiflorum* (10.2%); the wetland index was 1.79 (Table 10b).

Relative biomass was dominated by *C. diffusa* (26.1%), *P. punctatum* (23.1%), *P. dichotomiflorum* (14.1%), and dead (13.2%); the wetland index was 2.10 (Table 10c).

Similarity and Species Diversity Indices

Sorensen's similarity index (%S) revealed no clear patterns in species composition between transects (Table 11). Percentage similarities of transects within each marsh as well as among adjacent transects were low. Transects 3 and 4 were least similar (30.3%). Transects 7 and 2 were most similar (64.3%). Transect 3 was similar (50%) to transect 7. Transect 4 was most similar to transect 5 with a similarity index of 51.1%. Transect 8 was most similar to transect 2 (54.5%).

Species richness, diversity, and evenness indices did not vary greatly (Table 12). They were between 15 and 22 species in each transect. Species diversity (H') ranged from 0.734 to

Table 8b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 7 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	0.15	2.27	1.21
AST SUB	1	0.98	4.55	2.76
BAC HAL	3	7.58	17.42	12.50
COM DIF	2	3.36	1.52	2.44
CYP HAS	1	0.01	1.52	0.76
CYP ODO	2	0.29	2.27	1.28
CYP SPP	2	0.01	1.52	0.76
ELE SPP	2	0.00	0.76	0.38
ERI SPP	1	0.28	0.76	0.52
EUP CAP	4	65.43	21.21	43.32
HYD SPP	1	0.43	6.06	3.25
LUD OCT	1	0.29	3.03	1.66
MOL VER	1	2.82	9.85	6.34
PAN DIC	2	4.91	4.55	4.73
RAN SPP	2	0.85	3.79	2.32
SAC IND	3	4.77	12.12	8.45
SAL CAR	1	5.05	4.55	4.80
TYP LAT	1	2.80	0.76	1.78
CYPERACEAE	0	0.00	0.76	0.38
UDICOT	0	0.00	0.76	0.38
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		3.30	2.39	2.85

Table 8c. Mean and standard error of above ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], and associated wetland index value based on biomass plots (n=8) for Transect 7, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
AST SUB	1	1.11	1.110	0.09	3.45	1.66
BAC HAL	3	4.23	2.080	0.36	17.24	8.24
CYP ODO	2	0.18	0.180	0.02	3.45	1.62
ECL ALB	2	0.04	0.040	0.00	3.45	1.61
EUP CAP	4	927.38	233.950	78.99	24.14	50.79
MOL VER	1	2.27	1.260	0.19	13.79	6.55
PAN DIC	2	142.02	72.050	12.10	17.24	14.11
SAC IND	3	0.34	0.340	0.03	3.45	1.63
SAL CAR	1	66.55	66.550	5.67	3.45	4.45
SAM PAR	2	0.21	0.210	0.02	3.45	1.62
DEAD	0	29.74	29.740	2.53	3.45	2.88
TOTAL				100.00	100.01	100.01
WETLAND INDEX VALUE				3.56		

Table 9a. Mean and standard error for cover (%), height (cm), and density (#/m²) based on permanent and biomass plots (n=32) for Transect 8 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

	COVER		HEIGHT		DENSITY	
SPECIES	MEAN	±SE	MEAN	±SE	MEAN	±SE
ALT PHI	0.31	0.313	0.53	0.531	.	.
AST SUB	3.13	1.094	46.41	15.333	0.66	0.248
BAC HAL	1.67	0.568	19.25	5.281	0.75	0.215
CAL AME	0.00	0.003	0.31	0.313	0.19	0.188
CYP ODO	0.16	0.156	4.56	2.681	0.09	0.052
ECL ALB	0.00	0.003	0.66	0.656	0.03	0.031
EUP CAP	70.47	6.574	200.16	18.988	75.31	15.120
LUD OCT	0.16	0.156	1.47	1.063	0.16	0.102
LUD REP	0.47	0.469	0.88	0.875	0.06	0.063
MOL VER	0.10	11.000	7.00	0.000	.	.
PAN DIC	2.82	2.509	8.31	5.549	0.03	0.031
PAN HEM	2.50	2.500	3.44	3.438	.	.
PAN SPP	1.88	1.875	1.75	1.750	.	.
POL PUN	3.59	2.420	7.16	3.519	.	.
SAC IND	0.63	0.297	5.44	2.645	0.22	0.189
SAL CAR	0.16	0.156	3.44	3.438	0.06	0.063
SOL TOR	0.47	0.345	2.72	2.031	0.66	0.625
STA FLO	0.32	0.312	4.06	3.234	0.25	0.220
TYP LAT	0.16	0.156	3.91	3.906	0.03	0.031
POACEAE	0.32	0.312	0.34	0.344	0.25	0.250
USEEDLING	0.32	0.312	1.06	0.745	0.31	0.282

Table 9b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 8 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	0.35	1.25	0.80
AST SUB	1	3.52	10.00	6.76
BAC HAL	3	1.88	15.00	8.44
CAL AME	4	0.00	1.25	0.63
CYP ODO	2	0.18	3.75	1.97
ECL ALB	2	0.00	1.25	0.63
EUP CAP	4	79.27	33.75	56.51
LUD OCT	1	0.01	2.50	1.25
LUD REP	1	0.53	2.50	1.52
PAN DIC	2	2.82	2.50	2.66
PAN HEM	1	2.81	1.25	2.03
PAN SPP	2	2.11	1.25	1.68
POL PUN	2	4.04	5.00	4.52
SAC IND	3	0.53	6.25	3.39
SAL CAR	1	0.18	1.25	0.71
SOL TOR	4	0.53	2.50	1.51
STA FLO	3	0.36	2.50	1.43
TYP LAT	1	0.18	1.25	0.71
POACEAE	0	0.36	2.50	1.43
USEEDLING	0	0.36	2.50	1.43
TOTAL		100.00	100.00	100.00
WETLAND INDEX VALUE		3.56	2.83	3.20

Table 9c. Mean and standard error of above ground biomass (g/m^2); and relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], and associated wetland index value based on biomass plots (n=8) for Transect 8, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	BIOMASS MEAN	BIOMASS SE	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
AST SUB	1	17.61	12.820	0.97	8.70	4.84
BAC HAL	3	0.43	0.370	0.02	13.04	6.53
EUP CAP	4	1628.00	317.170	90.08	34.78	62.43
MIK SCA	2	0.04	0.040	0.00	4.35	2.18
PAN SPP	2	103.00	100.090	5.70	8.70	7.20
PHY ANG	3	0.02	0.020	0.00	4.35	2.18
POL PUN	2	4.03	4.030	0.22	4.35	2.29
DEAD	0	54.10	26.75	2.99	17.39	10.19
TOTAL				100.00	100.01	100.00
WETLAND INDEX VALUE				3.85		

Table 10a. Mean and standard error for cover (%), height (cm), and density (#/m^2) based on permanent and biomass plots (n=32) for Transect 9 of Apopka marsh, Fall 1990. A period (.) represents missing or irrelevant data.

	COVER		HEIGHT		DENSITY	
SPECIES	MEAN	±SE	MEAN	±SE	MEAN	±SE
ALT PHI	5.38	1.843	28.33	9.933	.	.
AMA AUS	.	.	9.38	9.227	.	.
AST SUB	0.31	0.308	2.09	2.061	0.06	0.062
AXO FUR	0.32	0.214	8.06	3.856	0.40	0.141
BAC HAL	0.31	0.308	1.63	1.599	0.50	0.088
CHL GLA	0.32	0.214	3.5	1.957	0.13	0.073
COM DIF	11.25	3.501	29.13	5.385	.	.
CYP SPP	0.01	0.003	1.97	1.938	0.03	0.031
ECL ALB	1.25	0.625	4.56	2.245	.	.
EUP CAP	0.31	0.214	7.34	5.058	0.06	0.043
LUD OCT	2.03	0.822	22.63	8.549	1.06	0.519
LUD PER	0.47	0.339	2.63	1.824	0.09	0.068
MEL COR	0.31	0.214	2.22	1.576	0.06	0.043
PAN DIC	6.73	2.800	30.13	9.093	0.53	0.342
PAN SPP	1.56	1.538	0.88	0.861	.	.
PAS SPP	1.26	0.827	22.41	14.406	0.38	0.22
PEL VIR	0.31	0.308	1.00	0.984	0.09	0.092
POL PUN	22.66	4.392	74.97	18.909	.	.
RHY IND	1.25	0.442	10.19	3.554	0.59	0.237
RHY SPP	0.16	0.154	1.88	1.845	0.03	0.031
SAG KUR	0.31	0.214	1.28	0.891	0.66	0.558
SAL CAR	0.16	0.154	2.97	2.922	0.09	0.092
SCI SPP	0.31	0.214	3.41	2.333	0.09	0.068
SES EXA	1.10	0.48	26.66	11.965	0.44	0.165
TYP LAT	0.16	0.154	7.00	6.89	0.19	0.156
TYP SPP	0.16	0.154	0.81	0.80	0.06	0.062

Table 10b. Relative cover, relative frequency, species importance value, and associated wetland index value based on permanent and biomass plots (n=32) for Transect 9 of Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	9.21	12.90	11.06
AMA AUS	1	0.00	0.81	0.40
AST SUB	1	0.53	0.81	0.67
AXO FUR	1	0.55	3.23	1.89
BAC HAL	3	0.53	0.81	0.67
CHL GLA	2	0.54	2.42	1.48
COM DIF	2	19.27	12.90	16.09
CYP ODO	2	0.01	0.81	0.41
CYP SPP	2	0.01	0.81	0.41
ECL ALB	2	2.14	3.23	2.68
EUP CAP	4	0.53	1.61	1.07
LUD OCT	1	3.48	5.65	4.56
LUD PER	1	0.80	1.61	1.21
MEL COR	3	0.53	1.61	1.07
PAN DIC	2	11.52	8.87	10.19
PAN SPP	2	2.68	0.81	1.74
PAS SPP	2	2.15	4.03	3.09
PEL VIR	1	0.53	0.81	0.67
POL PUN	2	38.80	16.94	27.87
RHY IND	1	2.14	5.65	3.89
RHY SPP	1	0.27	0.81	0.54
SAG KUR	1	0.53	1.61	1.07
SAL CAR	1	0.27	0.81	0.54
SCI SPP	1	0.53	1.61	1.07
SES EXA	3	1.89	6.45	4.17
TYP LAT	1	0.27	1.61	0.94
TYP SPP	1	0.27	0.81	0.54
TOTAL		100.00	99.99	100.00
WETLAND INDEX VALUE		1.85	1.73	1.79

Table 10c. Relative biomass, relative frequency, species importance value [(relative biomass + relative frequency)/2], and associated wetland index value based on biomass plots (n=8) for Transect 9, Apopka marsh, Fall 1990.

TAXA	WETLAND INDEX	RELATIVE BIOMASS	RELATIVE FREQUENCY	IMPORTANCE VALUE
ALT PHI	1	5.58	15.38	10.48
AXO FUR	1	0.00	2.56	1.28
CHL GLA	2	0.01	2.56	1.29
COM DIF	2	26.05	12.82	19.44
CYP SPP	2	0.04	2.56	1.30
ECL ALB	2	1.49	5.13	3.31
EUP CAP	4	7.92	2.56	5.24
LUD OCT	1	1.64	5.13	3.39
PAN DIC	2	14.13	10.26	12.20
PAN SPP	2	5.49	2.56	4.03
PAS SPP	2	0.42	2.56	1.49
POL PUN	2	23.10	12.82	17.96
RHY IND	1	0.32	2.56	1.44
SES EXA	3	0.58	2.56	1.57
DEAD	0	13.23	17.95	15.59
TOTAL		100.00	99.97	99.99
WETLAND INDEX VALUE			2.10	

Table 11. Sorensen's percent similarity comparisons between each transect at Apopka marsh, Fall 1990. Axes represent transects.

Transect	1	2	3	4	5	6	7	8
1	***	61.5	38.4	36.4	38.9	46.7	57.1	45.4
2		***	46.1	42.4	38.9	40.0	64.3	54.5
3			***	30.3	38.9	40.0	50.0	45.5
4				***	51.1	27.0	40.0	20.7
5					***	50.0	57.9	25.0
6						***	43.8	38.5
7							***	50.0
8								***

Table 12. Species richness (R), diversity (H'), maximum diversity (HMAX) and, evenness (J) for Transects 1 through 8 for Apopka marsh, Fall 1990.

Transect	R	H	H_{max}	J
1	15	0.917	1.17	0.784
2	16	0.917	1.17	0.784
3	19	0.976	1.27	0.769
4	27	1.118	1.43	0.782
5	21	1.158	1.32	0.877
6	22	1.035	1.34	0.772
7	20	1.023	1.30	0.787
8	20	0.734	1.30	0.565

1.158. Maximum diversity (H_{MAX}) ranged from 1.17 to 1.43 and evenness (J) varied from 0.565 to 0.877.

Summary of Transect Data

Vegetative dominance in one or more categories was shared by six species (*A. subulata, E. capillifolium, Panicum* spp., *P. dichotomiflorum, P. punctatum,* and *T. latifolia*) in both the north and south marshes. This was primarily due to the composition of transect 5 and the canal edges. This commonality occurred in spite of the community dominance by *E. capillifolium* in the north marsh. The similar species composition of the north and south marshes can be attributed to the exploitation of patches and canal edges. The importance value based wetland indices in the south marsh ranged from 1.79 (transect 9), an obligate wetland characterization, to 2.29 (transect 1), a facultative-wetland characterization. In the north marsh importance value based wetland index ranged from 2.54 (transect 5), a facultative-wetland characterization, to 3.20 (transect 8), a facultative characterization.

A plot of mean biomass vs. mean cover revealed a curvilinear pattern in which cover peaks at about 900g/m^2 biomass (Figure 3). The level at which cover peaks is about half the level of peak biomass in the sample.

TOTAL ABOVE-GROUND BIOMASS

Significant differences in mean above-ground biomass per transect were found ($F=4.48$, $p>0.0005$; Table 13a). Analysis of above-ground biomass revealed large coefficients of variation among (C.V. = 59.1%, Table 13a) and within (C.V. = 38.8% to 92.4%, Table 13b) transects. A Student-Newman-Keuls multiple range test revealed that the clearest differences in transect means were between T5 and T8 (Table 14). No gradient in biomass was evident from these data. Figure 4 depicts total above-ground biomass by transect and node to show the spatial heterogeneity of biomass.

Potential problems with meeting the assumptions of ANOVA were encountered. Tests of equality of variances, F_{MAX} ($F=12.7$ $p=0.01$) and Bartlett's Test ($X^2=16.3$, $p=0.01$)indicated that variances were similar enough to conduct an analysis of variance (ANOVA) to determine if differences in biomass (g/m^2) exist between transects. The Shapiro-Wilk test for normality of the sample distribution revealed that deviations occurred at four transects (T_2 $W=0.8$, $p=0.02$; T_3 $W=0,8$, $p=0.03$; T_5 $W=0.7$, $p=0.01$; and T_7 $W=0.7$, $p=0.01$) (SAS 1988). Since the deviations from normality were not too great (W close to 1.0) and tests of variance equality were acceptable (Sokal and Rohlf 1981) and ANOVA was conducted.

Above-ground biomass along transect 9 was lowest (200g/m^2) near the inflow area (node 1) and increased to 400 and 500 g/m^2, respectively, at nodes 2 and 3 (Figure 5). A dramatic increase in biomass occurred between nodes 3 and 4 with node 4 having over 1000 g/m^2 above-ground biomass. Biomass remained relatively constant at 1000 g/m^2 (+/- 200-300 g/m^2) at nodes 5-10.

ABOVE-GROUND LIVE/DEAD BIOMASS RATIOS

Live/dead ratios were relatively low in transects 1 - 5 and 9, and high in transects 6 - 8 (Table 15). High live/dead ratios reflected dominance by *Eupatorium capillifolium*. At the time of sampling the *E. capillifolium* community contained little live/dead stratification with most of the community standing tall and alive. In contrast, transects 1 - 5 contained a more diverse stratification with a large proportion of standing dead in the overstory. At the end of Nov. 1990, community senescence began (Stenberg, field observation). By Jan. 1991, most plants

Figure 3. Mean Percent Cover (%) vs Mean Above-Ground Biomass (g/m^2) for Transects 1-8, all Nodes, Apopka Marsh, Fall 1990.

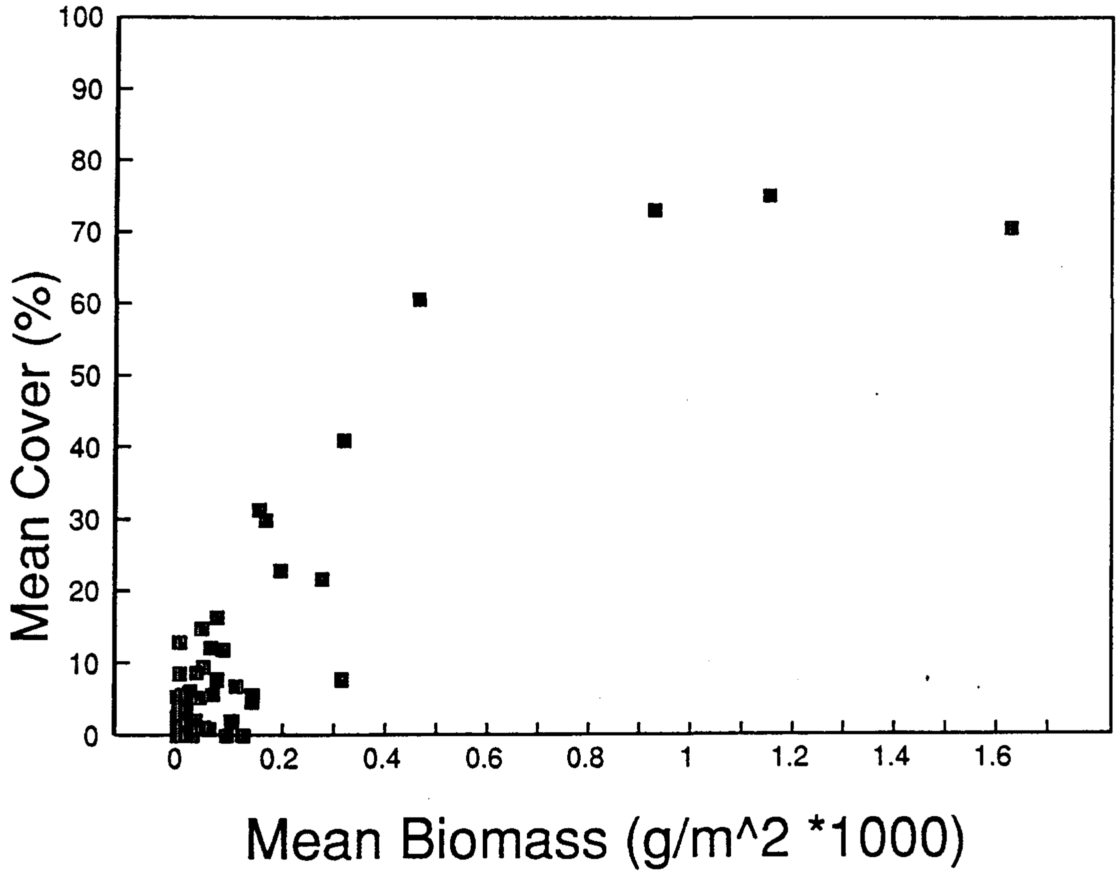


Table 13a. ANOVA results for comparisons of total above-ground biomass for Transects 1-8 in Apopka marsh, Fall 1990. Based on Sokal annd Rohlf (1981).

Source	DF	SSE	MSE	F Value	Pr > F
Model	7	12410691.10	1772955.87	4.48	0.0005
Error	56	22160426.69	395721.91		
Corrected Total	63	34571117.79			

R-Square	C.V.	Root MSE	Biomass Mean
0.35	59.09	629.06	1064.49

Table 13b. Coefficients of variation for above-ground biomass in Apopka marsh, Fall 1990.

	TRANSECT								
	1	2	3	4	5	6	7	8	9
CV	81.4	71.9	53.2	45.6	92.4	38.8	47.2	44.6	42.9

Table 14. SNK multiple ranges test: Comparison of total above-ground biomass in Apopka marsh, Fall 1990.

Tran #	5	4	3	1	7	2	6	8
SNK	********	********	********	********				
			********	********	********	********	********	********
	********	********	********	********	********	********	********	

Figure 4. Total Above-Ground Biomass (g/m^2) for Transects 1-8 vs Nodes 1-8, Apopka Marsh, Fall 1990.

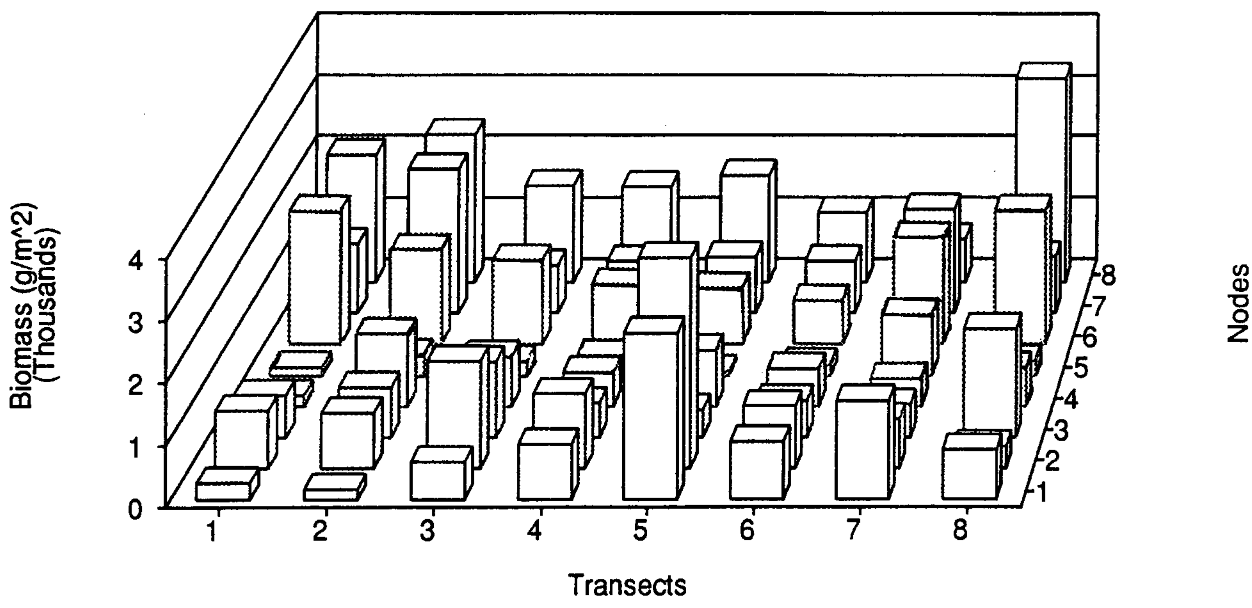


Figure 5. Total Above-Ground Biomass (g/m^2) vs Nodes, Transect 9, Apopka Marsh, Fall 1990.

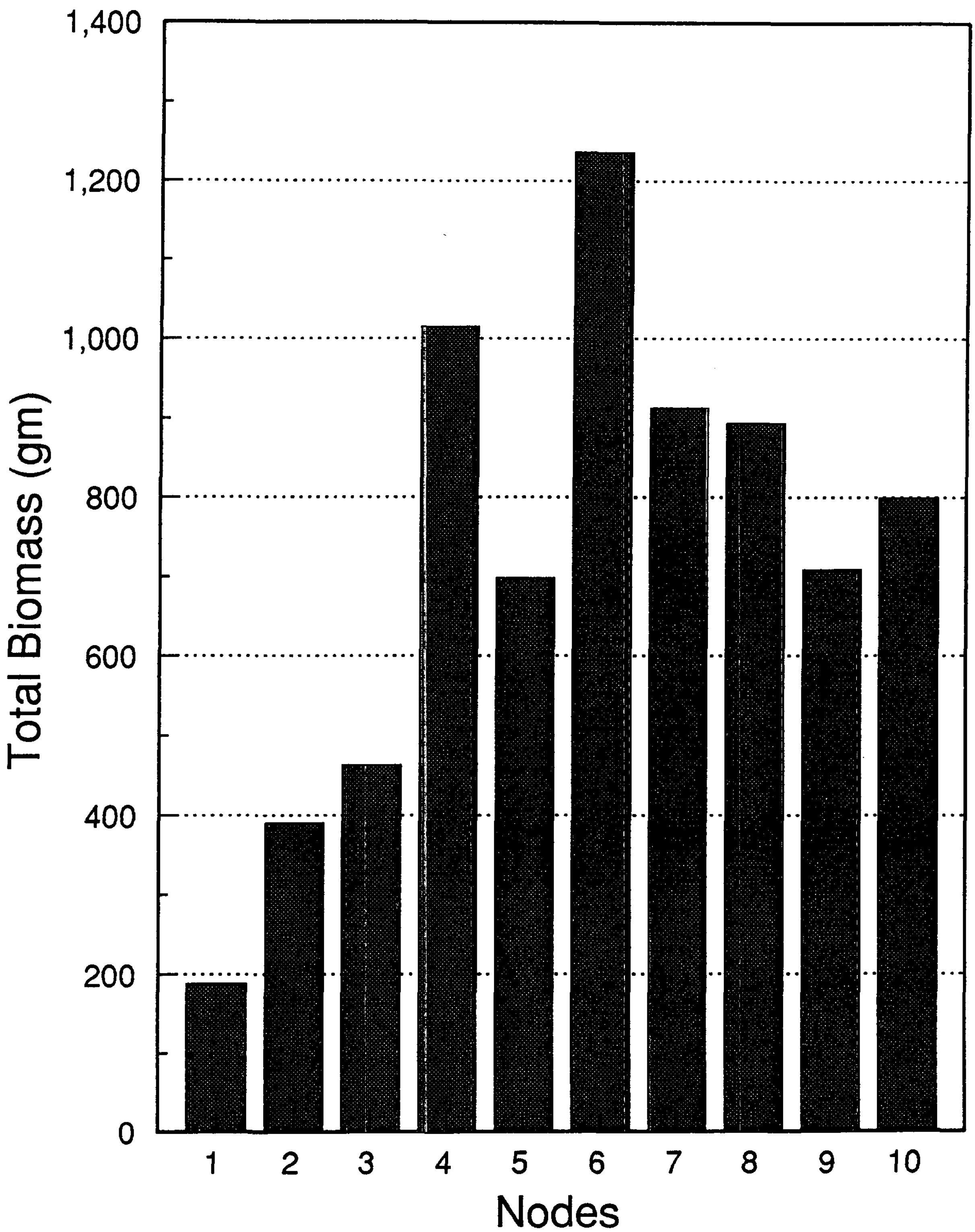


Table 15. Above ground biomass (n = 8, except Transect 9 where n = 10) summarized by transect: mean total biomass (g/m^2), mean dead biomass (g/m^2), mean live biomass (g/m^2) and live to dead ratio biomass at Apopka marsh, Fall 1990.

TRANSECT	TOTAL	DEAD BIOMASS	LIVE BIOMASS	LIVE/DEAD RATIO
1	997.87	198.21	799.66	4.03
2	1296.19	568.66	727.52	1.28
3	827.94	141.46	686.49	4.85
4	661.04	81.85	580.31	7.09
5	310.30	39.85	270.45	6.79
6	191.29	55.30	1386.00	25.07
7	1174.09	29.74	1144.35	38.48
8	1807.25	54.12	1753.14	32.40
9	729.95	88.32	153.28	1.74

except *Typha latifolia* were in an advanced state of senescence. Therefore, reported live/dead ratios were as high as would be expected during the 1990 growing season.

ABOVE-GROUND TO BELOW-GROUND BIOMASS COMPARISON

Above-ground biomass tended to be greater than below-ground biomass (Table 16) and was independent of below-ground biomass at the sampling intensity we utilized. Results of a correlation analysis revealed no significant relationships among sampling nodes, root biomass, or shoot biomass (Table 17). Mean root biomass per plot (mean of three sample cores) was highly variable (Figures 6a, 6b, and 6c).

PHENOLOGY

Results of phenological measurements seemed to indicate that sampling was conducted after seed fall for most plants. Except for transect 1 (percent occurrence of each flowering index was full canopy = 17%, 2/3 canopy = 20%, and 1/3 canopy = 28%), most plants were not flowering or had up to 1.3 of the canopy in flower (Figure 7). Most fruiting activity within the immature and mature (Figures 8a and 8b, respectively) categories was limited to a maximum of 1/3 of the canopy.

WATER LEVEL

Water levels were collected in each plot with simultaneous measurements at hydrological stations when possible. These data will become meaningful when the stage records become available. The data may not be useful at this time due to changes in water management during sampling. During our sampling expeditions the water inlet was opened allowing a rapid increase in water level in the south marsh. Continuous pumping in the north marsh maintained water levels below soil surface. Water level data are available in Appendix A.

Table 16. Root biomass (g/m^2), shoot biomass (g/m^2), and root to shoot ratios by node for Transects 1, 2, and 9, Apopka marsh, Fall 1990.

	TRANSECT	NODE	BIOMASS (g/m^2) ROOT	BIOMASS (g/m^2) SHOOT	ROOT/SHOOT
	1	1	689.95	281.86	2.448
	1	2	69.44	168.48	0.412
	1	3	25.30	612.24	0.041
	1	4	254.82	890.52	0.286
	1	5	340.56	2686.16	0.127
	1	6	8.66	942.66	0.009
	1	7	62.14	1600.36	0.039
	1	8	1283.12	800.66	1.603
Mean (SE)	1		341.75 (156.89)	997.87 (287.11)	0.621 (0.320)
	2	1	163.66	943.50	0.173
	2	2	236.32	901.32	0.262
	2	3	17.83	1732.34	0.010
	2	4	2.89	1207.21	0.002
	2	5	80.98	3396.54	0.024
	2	6	193.54	1015.53	0.191
	2	7	168.07	805.06	0.209
	2	8	60.78	367.98	0.165
Mean (SE)	2		115.51 (30.52)	1296.19 (329.27)	0.130 (0.036)
	9	1	28.86	188.12	0.153
	9	2	107.80	390.24	0.276
	9	3	17.15	462.04	0.037
	9	4	53.82	1014.33	0.053
	9	5	304.06	697.65	0.436
	9	6	1138.14	1235.36	0.921
	9	7	117.14	912.06	0.128
	9	8	906.23	892.99	1.015
	9	9	13.24	708.32	0.019
	9	10	40.41	798.38	0.051
Mean (SE)	9		272.69 (128.96)	729.95 (99.05)	0.309 (0.117)
Overall Mean (SE)			245.57 (69.55)	986.61 (141.40)	0.350 (0.111)

Table 17. Correlation Coefficients for TRANSECT, NODE, SHOOT (Above-ground Biomass) and ROOT (Below-Ground Biomass) and RATIO (ROOT/SHOOT Ratio) for Transects 1, 2, and 9 at Apopka marsh, Fall 1990.

Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 26

	TRANSECT	NODE	ROOT	SHOOT	RATIO
TRAN	1.00000 0.0	0.18771 0.3585	-0.26766 0.1862	0.03401 0.8690	-0.17040 0.4053
NODE	0.18771 0.3585	1.00000 0.0	0.14860 0.4688	0.19635 0.3364	-0.03411 0.8686
ROOT	-0.26766 0.1862	0.14860 0.4688	1.00000 0.0	-0.01316 0.9491	0.15528 0.4488
SHOOT	0.03401 0.8690	0.19635 0.3364	-0.01316 0.9491	1.00000 0.0	-0.26432 0.1919
RATIO	-0.17040 0.4053	-0.03411 0.8686	0.15528 0.4488	-0.26432 0.1919	1.00000 0.0

Figure 6a. Mean Below-Ground Biomass (g/m^2) ±SE vs Nodes, Transect 1, Apopka Marsh, Fall 1990.

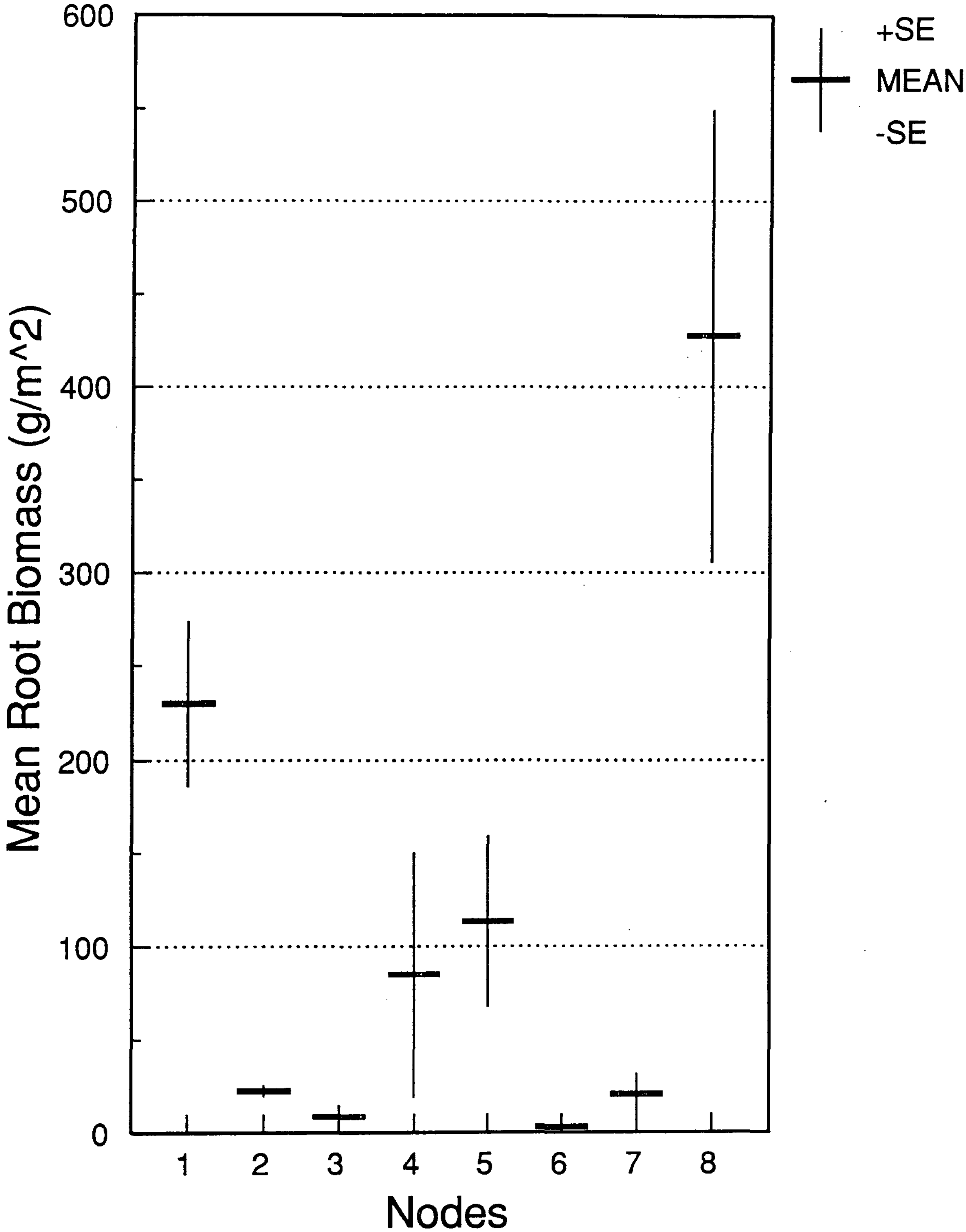


Figure 6b. Mean Below-Ground Biomass (g/m^2) ±SE vs Nodes, Transect 2, Apopka Marsh, Fall 1990.

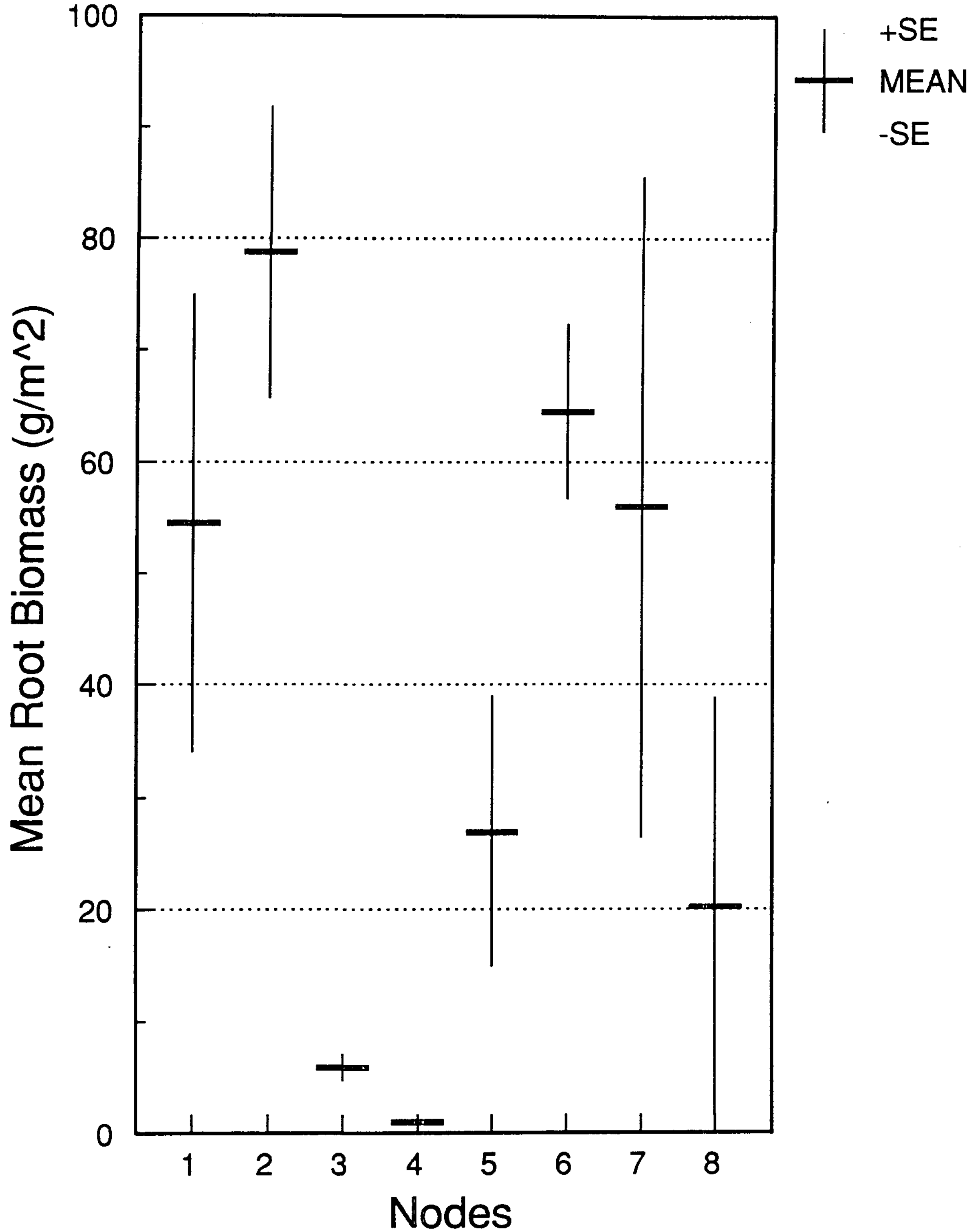


Figure 6c. Mean Below-Ground Biomass (g/m^2) ±SE vs Nodes, Transect 3, Apopka Marsh, Fall 1990.

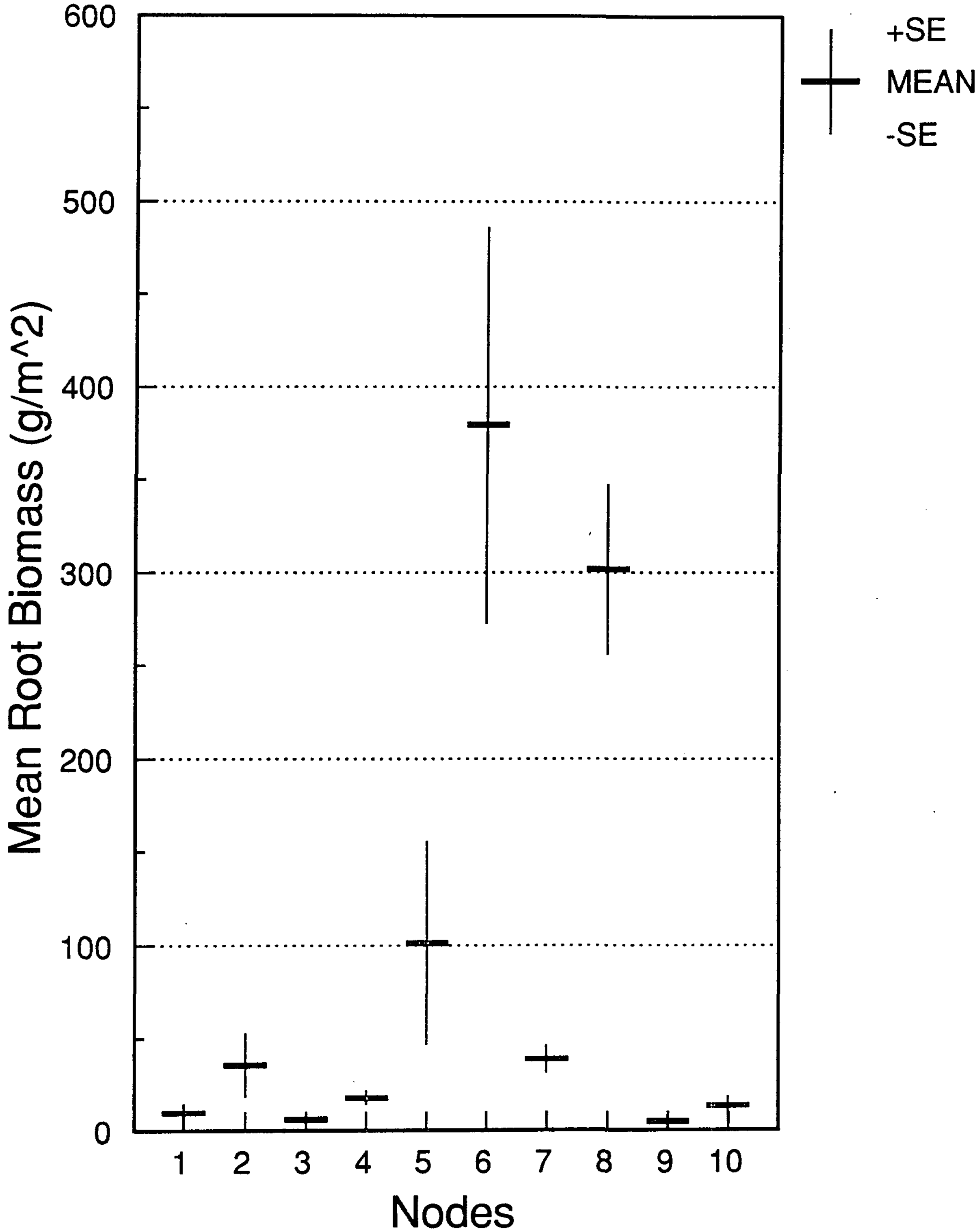


Figure 7. Flowering Phenology. Percent of Total Flowering Observations for Flowering Index vs Transects 1-9.

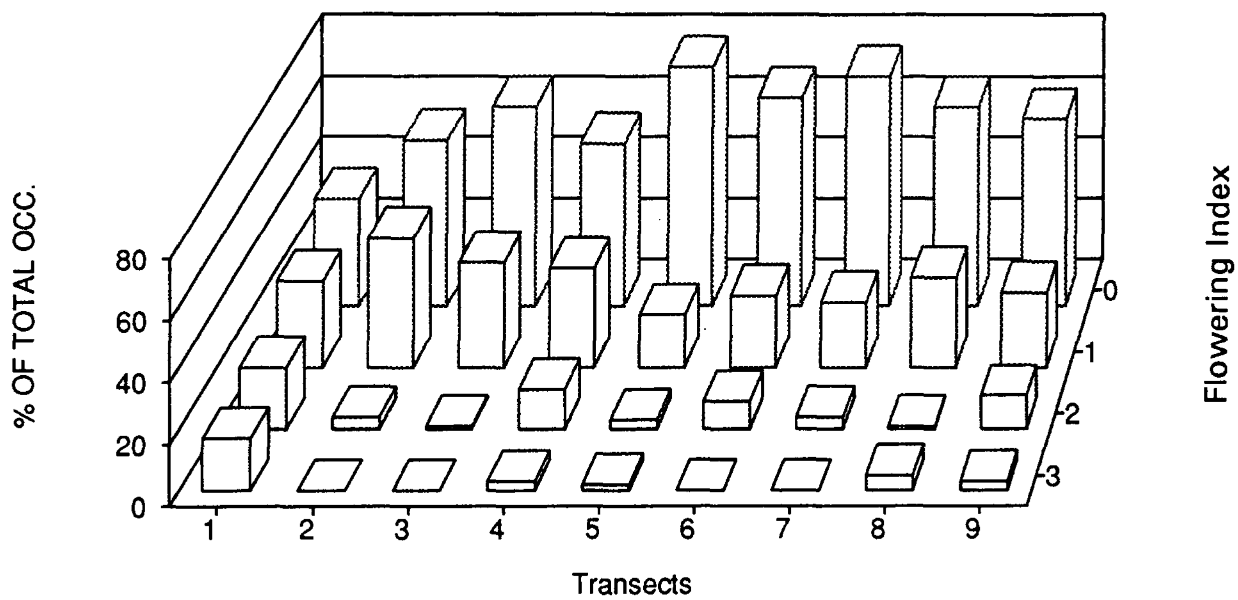


Figure 8a. Immature Fruiting Phenology. Percent of Total Immature Fruit Observations for Fruiting Index vs Transects 1-9.

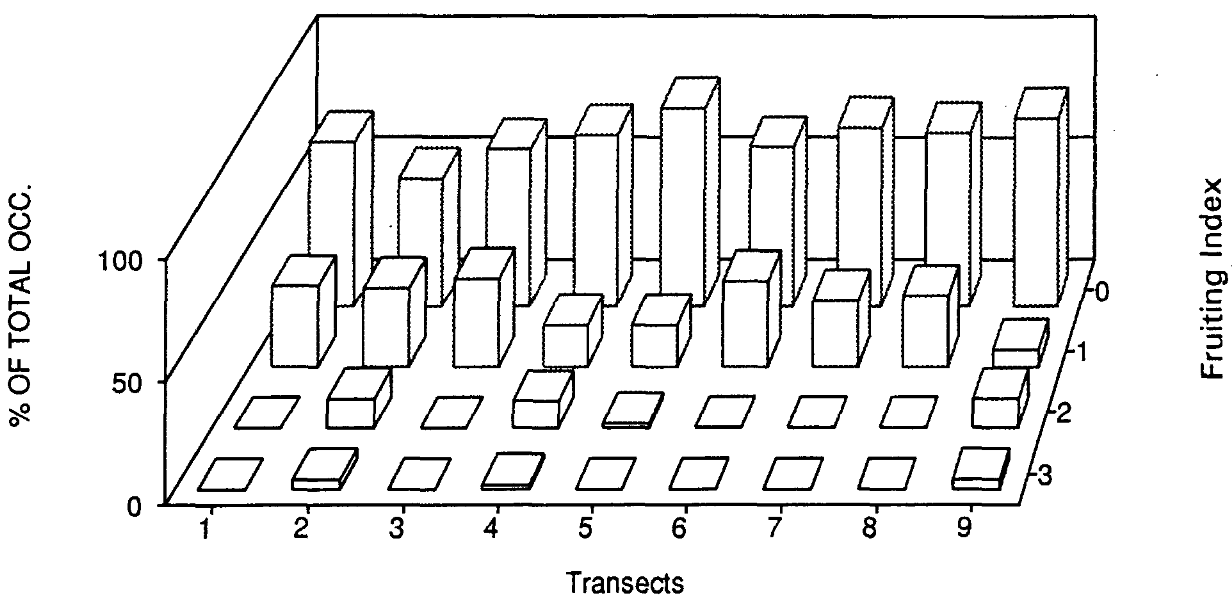
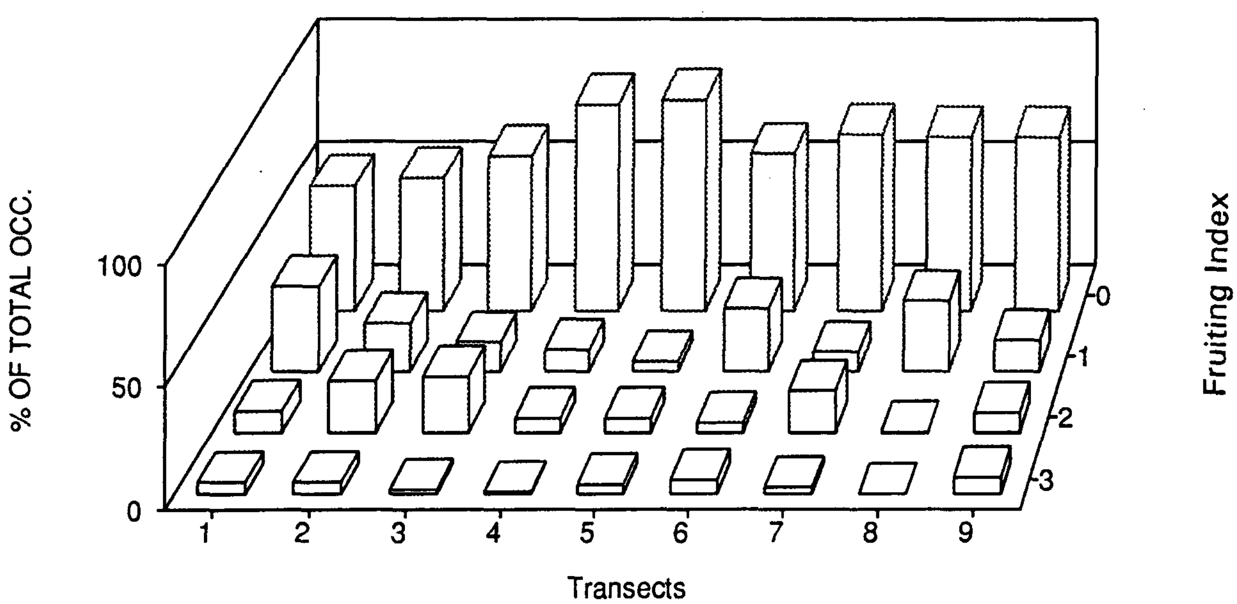


Figure 8b. Mature Fruiting Phenology. Percent of Total Mature Fruiting Observations for Fruiting Index vs Transects 1-9.



DISCUSSION

SAMPLING STRATEGY

Transects 1 to 8 were arranged to measure the presence of large-scale gradients in net primary production (based on annual maximum minus annual minimum biomass) and community succession. Sampling nodes (transects 1 to 8) were placed evenly across the width of the marsh to estimate within transect variation. The sampling grid arrangement will allow measurements of changes over the next several years in the marsh regardless of water flow patterns and distributions of nutrients.

Transect 9 has a different sampling objective than the other transects. The 600-m transect was designed to provide a higher resolution measurement of anticipated changes in the marsh. It was placed nearly parallel to flow, beginning near the lake water inlet. The node spacing along this transect was chosen to allow for addition of more evenly spaced nodes. The closely placed nodes (N_{1-7}) near the inlet will probably show signs of rapid change; however, the rate of change is not presently known. Nodes 8-10 will probably respond more slowly.

The objective of collecting baseline vegetation data was met in Fall 1990. Sampling was completed just prior to senescence of most of the plant communities in the demonstration marsh. In contrast to most plant species, *T. latifolia* seemed to have undertaken an expansion in coverage while the rest of the community was declining towards its winter dormancy.

PLANT COMMUNITY STRUCTURE AND WETLAND INDEX VALUES

Species composition was somewhat similar to the composition (21 of 30 species in common) of the Blue Cypress Lake floodplain marsh (Lowe 1981) located in the upper St. John's River basin. Patterns of dominance in the Blue Cypress Lake marsh were similar to the Apopka marsh with *E. capillifolium* and *P. punctatum* being important. The importance of *E. capillifolium* in the Apopka marsh seems to have resulted from natural drought and artificial drawdown. *Cladium jamaicense* and *Panicum hemitomum* were the most important species in the Blue Cypress Lake marsh suggesting fire as a controlling factor (Lowe 1986). Apparently fire has been missing from the remnants of the Apopka marsh ecosystem, possibly explaining the lack of *C. jamaicense* and low coverage of *P. hemitomum*. Species composition was also similar to that of a research marsh in the Palatlakaha River basin (7 of 10 species in common) south of Clermont, Florida (Dolan et al. 1981). Dominance in the Clermont marsh by *Sagittaria lancifolia* and *Pontedaria cordata* differentiates it from the Apopka marsh.

The north and south marshes shared dominance by a small contingent of species: *A. subulata*, *C. diffusa*, *E. capillifolium*, *L. octovalvis*, *Panicum* spp., *P. dichotomiflorum*, and *P. punctatum*. Although, patterns of community dominance were not similar between the two marshes. Transect 1 (south marsh) was dominated by *E. capillifolium* and transect 5 (north marsh) shared similar species with south marsh transects. Wetland status seemed to result from a shorter history of farming and a lack of control of water levels in the south marsh. To assist in the characterization of plant community types we have used the wetland indices as developed by Reed (1989). As the value of wetland index increases the community it describes is considered to be less of a wetland. The north marsh exhibited facultative-wetland to facultative characteristics. Plant community dominance by *E. capillifolium* and *Baccharis halimifolia* overwhelmed associated species. This might be the result of a long history of farming and maintenance of low water levels. The presence of *C. diffusa* as an important species along transect 5 resulted from the presence of low patches near the transect.

It is likely that the present community status will be short-lived as important community controlling factors, such as water depths and hydroperiods (Holling 1973, Thibodeau and Nickerson 1985), are increased. Although transition to wetland species is anticipated to occur relatively rapidly, the development of a complex wetland community and wetlands succession proceeding under the influence of increased flooding may be relatively slow (Thibodeau and Nickerson 1985).

Within the north marsh, the expansion of established wetland plants, seed bank, and dispersal of seeds from outside the marsh may provide the basis for succession. Succession will depend on the juxtaposition of controlling factors (e.g., water depth, hydroperiod, timing of flooding) and the availability of propagules (van der Valk 1978, 1981). The present species composition will change to dominance by plant species adapted to long-term flooding. Centers of dominance by wetland plant species (e.g., canal edges and disjunct patches) will most likely act as foci (Moody and Mack 1988). The south marsh may remain stable for the near future due to its status as a wetland community. The south marsh may provide an important propagule source to the north marsh.

Percent similarity between transects showed no clear trends; often adjacent transects were dissimilar and unpredictable (Table 11). Differences between transect wetland indices were related to *E. capillifolium* as the dominant facultative-upland species in the marsh. The two transects with the highest percent similarity were transects 2 in the south marsh and transect 7 in the north marsh. These two areas, although in different marshes, had a similarity of 64.3% with seven species in common. Of the four most dominant species, only one--*E. capillifolium*--was common to both with an importance value of 11.3% for transect 2 and 43.3% for transect 7. Also, although the north marsh was dominated by a few facultative to facultative-upland species, numerous obligate to facultative-wetland species are a part of the community structure. This suggests that differences exist in species dominance but no gradient in species composition exists along the distance gradient from the lake water inflow to the outflow pumps.

TOTAL ABOVE-GROUND BIOMASS

Above-ground biomass does not exhibit a gradient from transects 1 through 8 (Figure 4; Tables 13, 14). Large mean biomass values exist in transects 2, 7, and 8 because of a preponderance of *E. capillifolium* in the biomass collection. Transects 7 and 8 are dominated in every respect by *E. capillifolium*, whereas, dominance as determined by other measures of community structure in transect 2 is shared with *P. punctatum* (Table 3a, 3b, 3c.).

Low biomass values in transects 4 and 5 may result from low site quality. Transect 4 seems to be recovering from the effects of scraping. Transect 5 is perched on the edge of a marsh-bisecting levee. The compacted, sandy soil along transect 5 seems to have resulted in a relatively low site quality (e.g., low nutrient availability and high bulk density). In addition, transect 5 has the highest species diversity and the third highest species richness. The seemingly poor site quality may lead to higher species diversity and richness (Huston 1979). Plots falling in both wet and dry sites may have produced this result since a wider range of habitats existed for plants to exploit.

Our live above-ground biomass estimates (153-1753 g/m^2) had a larger range and larger values than that of a control plot in the nearby Clermont marsh (500-650 g/m^2). Also, dead above-ground biomass at our site had a larger range and similar upper values (30-569 g/m^2)

when compared to the Clermont marsh (414-587 g/m^2) (Bayley et al. 1985). Differences are probably due to greater range of habitats sampled in the Apopka marsh.

A comparison of mean cover to mean above-ground biomass resulted in an approximately pattern that leveled at about 900 g/m^2. Since the maximum of this curve falls at about half the total mean biomass, mean cover will not provide an independent estimate of biomass.

ABOVE-GROUND LIVE/DEAD BIOMASS RATIOS

The live/dead biomass ratios seemed to reflect community types. Low ratios were common for the perennial, wetland communities (transects 1-5, 9; L/D ratios 1.28-7.09). These ratios seem to have reflected a community in a steady-state. Bayley et al. (1985) found similar values (L/D ratios 1.3-3.6) in a perennial marsh near Clermont, Florida. In stark contrast, high live/dead ratios were common in the annual, facultative *E. capillifolium* communities (transects 6-8; L/D ratios 25.1-38.5). This community seems to be in an early state of development with most of its biomass in living stems and green leaves (Odum 1969). High live/dead ratios could be a unique character of *E. capillifolium* communities since the entire community grows rapidly until a quick, dramatic senescence at the beginning of winter (Bob Cooper, Pers. Obs.). Further study will provide insights into these patterns.

ABOVE-GROUND TO BELOW-GROUND BIOMASS COMPARISON

Above-ground biomass seemed independent of below-ground biomass. Comparisons of mean root biomass indicated a great deal of variation within the root samples. Variation within below-ground biomass estimates has limited the number of researchers willing to expend the time and effort required to collect these data (Bradbury and Grace 1983). High variation of estimates seems to result from the nature of this stoloniferous community. It seems as if large concentrations of roots will only be found near large, central stems (if they exist). During sampling of above-ground biomass, rooting was common at nodes. The roots coming from nodes tended to be very fine and concentrated in the litter layer on the soil surface. The roots sampled using the coring method occasionally were in surface mats, but usually were found in the upper 5-10 cm of soil. Therefore, the method of sampling roots may miss the major rooting component, or the rooting patterns of the plants we studied were diffuse and highly variable at the sampling intensity we employed. A review of literature reporting the results of studies of primary productivity (de la Cruz 1978, Brinson et al. 1981, Bradbury and Grace 1983, and Mitsch and Gosselink 1986) provide little insight into this problem. Most of the studies reviewed have been conducted in established, rhizomatous communities. Since this community type is in transition back to marsh it may be rare enough to have provided little opportunity for study. Future sampling efforts will attempt to address this problem by increasing sampling intensity.

PHENOLOGY

Measurements of phenology indicated that little flowering or fruiting was evident. Transect 1 proved to provide the exception to this observation with a range of flowering. Since transect 1 was sampled first, it may have represented the end of the flowering and fruiting season. The remainder of the transects exhibited little flowering activity, with most having flowering indices of 0 (T_1=30%-T_5=70% of total observations per transect) and ⅓ (T_5=10%-T_3=30% of total observations per transect) of the canopy (Fig. 7). This pattern seems to represent the phenological state after the end of the flowering season.

Immature and mature fruit presence followed a trend similar to flowering. Again, the pattern seemed to represent the end of the season for fruiting (Fig.s 8a and 8b). Further studies using seed traps will help elucidate phenological patterns.

CONCLUSION

The Apopka marsh contained two distinct communities when viewed from the perspective of community dominance--a community dominated by facultative-upland species in the north marsh, and a community dominated by facultative-wetland species in the south marsh. Even in areas dominated by facultative-upland species, the understory provided a different perspective. A large contingent of wetland plant species persisted throughout the entire marsh. The demonstration marsh seems to have the potential to succeed to a functioning marsh, given successful management.

Biomass collection has provided a baseline vegetation standing crop and material for nutrient analysis. Evaluation of biomass data revealed no definite gradient of biomass from the marsh water inlet to the outlet pumps. If a gradient develops as a result of additions of nutrient-laden lake water it should be detectable. Below-ground biomass revealed a very large sample variation. This variation may lead to problems detecting changes in below-ground biomass. In the future, sample sizes will be increased and distributed across the marsh sampling network to help alleviate problems of sample variation. No nutrient analysis has been done to date.

Phenological measurements seemed to indicate that peak flowering and fruiting had passed by the time sampling commenced. Additional measurements in spring and fall will help improve our understanding of this pattern.

The seed bank may prove to be the foundation for a rapid marsh succession (van der Valk 1978, 1981). If water levels can be managed to provide dry soil or shallow water periods, the seed bank may be important. Germination strategies based on soil moisture may favor one suite of plant species over another (van der Valk 1978). Research remains to be done to determine the potential contribution of the seed bank to marsh succession.

APPENDIX A

Appendix A. Mean Water Depth (cm) for Apopka Marsh, Fall 1990. Mean and (Standard Error) by Transects (TRAN) and Nodes (N_{1-10}).

TRAN	N_1		N_2		N_3		N_4		N_5	
1	33.8	(2.0)	48.3	(7.5)	36.6	(1.2)	38.8	(0.7)	33.9	(0.9)
2	23.0	(1.5)	30.5	(1.9)	21.0	(0.8)	37.1	(1.8)	32.1	(1.4)
3	17.8	(1.1)	32.3	(0.9)	29.1	(0.9)	17.8	(1.0)	27.2	(1.2)
4	19.1	(2.2)	10.2	(1.8)	4.7	(1.0)	17.7	(2.1)	13.5	(1.1)
5	0.8	(0.4)	0.0	(.)	0.0	(.)	2.5	(1.3)	0.0	(.)
6	1.9	(0.6)	18.8	(11.0)	0.0	(.)	4.1	(0.8)	3.9	(0.7)
7	0.0	(.)	0.0	(.)	0.0	(.)	8.0	(1.6)	6.3	(1.2)
8	0.0	(.)	0.0	(.)	6.7	(1.7)	12.1	(0.8)	6.3	(1.4)
9	20.3	(1.2)	22.3	(2.5)	23.4	(1.2)	14.7	(0.9)	14.2	(0.5)

TRAN	N_6		N_7		N_8		N_9		N_{10}	
1	19.6	(0.8)	22.5	(1.3)	21.1	(1.1)	.	.	.	.
2	52.1	(1.4)	46.0	(1.5)	52.3	(0.9)	.	.	.	.
3	29.0	(2.1)	17.4	(0.9)	9.4	(0.9)	.	.	.	.
4	14.0	(1.4)	13.3	(2.3)	16.3	(1.7)	.	.	.	.
5	0.0	(.)	4.3	(1.6)	1.3	(0.7)	.	.	.	.
6	7.9	(1.4)	2.6	(1.0)	0.0	(.)	.	.	.	.
7	14.5	(1.2)	12.9	(1.2)	9.0	(1.6)	.	.	.	.
8	33.8	(10.6)	14.2	(0.9)	0.0	(.)	.	.	.	.
9	36.7	(0.5)	41.3	(2.8)	40.5	(1.0)	39.0	(1.0)	44.7	(1.1)

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