Macrophytes as Bioindicators of Freshwater Marshes in Florida

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Project Goal:

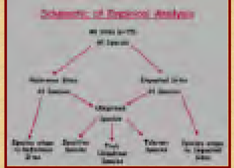
To determine the applicability of macrophytes as bioindicators of isolated herbaceous wetland condition along a gradient of agricultural disturbance (cattle, crops, & citrus).

Collection Procedures:

- Four transects: N,S,E,W
- Elongated 5m x 1m quadrants
- Start at wetland/upland boundary
- Note presence in each quadrant
- Sample from upland edge to wetland center

Analysis Parameters:

- 75 marshes sampled
- Species Composition
- Annual or perennial
- Invasive exotics



Definitions (see example, below):

- **Unique Species:** occurring only in Reference Sites or in Impacted Sites
- **Sensitive Species:** occur in more Reference Sites than Impacted Sites
- **Tolerant Species:** occur in more Impacted Sites than Reference Sites.
- **Truly Ubiquitous Species:** occur equally in Reference and Impacted Sites.

EXAMPLE		# Sites Occurring		
Species	Category	Impacted	Reference	Relative Tolerance
Gratiola ramosa	Unique Reference	0	10	-10
Lachnanthes caroliniana	Sensitive	3	13	-10
Polygonum hydropiperoides	Tolerant	11	6	5
Rhynchospora microcephala	Truly Ubiquitous	5	5	0

Unique Reference: the presence of these plants indicates very low disturbance

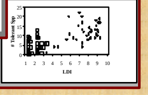
Species	Total Sites	% of all sites	% Reference sites
Gratiola ramosa	10	13.3	27.8
Rhynchospora filifolia	8	10.7	22.2
Stillingia aquatica	5	6.7	13.9
Brasenia schreberi	4	5.3	11.1
Drosera brevifolia	4	5.3	11.1
Drosera capillaris	4	5.3	11.1

Unique Impacted: the presence of these plants indicates high disturbance

Species	Total Sites	% of all sites	% Impacted sites
Cyperus polystachyos	18	24	46.2
Cuphea carthagenensis	17	22.3	43.6
Eclipta prostrata	12	16	30.8
Paspalum notatum	12	16	30.8
Setaria parviflora	10	13.3	25.6
Alternanthera philoxeroides	8	10.7	20.5

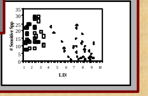
Tolerant Species: these increase with increasing disturbance. The smaller the R/I ratio, the more likely the plant was found in disturbed conditions.

Species	# Imp Sites	# Ref Sites	Ratio R/I	Relative Tolerance	Total Sites
Juncus effusus	22	1	0.05	21	23
Diodia virginiana	27	6	0.22	21	33
Commelina diffusa	17	1	0.06	16	18
Phyla nodiflora	16	1	0.06	15	17
Polygonum punctatum	19	4	0.21	15	23
Panicum repens	14	1	0.07	13	15



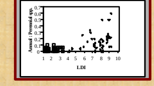
Sensitive Species: these decrease with increasing disturbance. The smaller the I/R ratio, the more likely the plant was found in reference conditions.

Species	# Impacted Sites	# Reference Sites	Ratio I/R	Relative Tolerance
Hypericum fasciculatum	2	17	0.12	-15
Panicum erectifolium	6	20	0.30	-14
Andropogon virginicus	17	31	0.55	-14
Lachnanthes caroliniana	7	19	0.37	-12
Eriocaulon decangulare	4	15	0.27	-11
Proserpinaca pectinata	11	22	0.50	-11



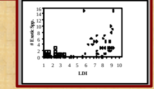
Annual/Perennial Ratio:

the anticipated response of wetlands to disturbance is an increase in opportunistic "weedy" annual species.



Invasive Exotics:

exotics are indicative of anthropogenic disturbances.



SUMMARY

- Macrophytes are potentially useful bioindicators
  - — No. Sensitive & Tolerant Plants
  - — No. Unique Reference & Impact
  - — No. Invasive & Exotic Species
  - — Annual : Perennial Ratio
- Additional analysis includes plant abundance within each wetland.