OLD SOUTH DADE LANDFILL

Dade County, Florida

6th SEMI-ANNUAL MONITORING REPORT

FDEP Permit #EL 13-0138315-001

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Submitted for:

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Introduction/Executive Summary

Creative Wetlands, Inc. was requested by Aquagenix to perform monitoring of the Old South Dade Landfill Project, in Dade County, Florida. Monitoring will consist of gathering data in set quadrat sampling areas along three transect lines. The transect lines run from east to west through the Slough Area, Enhancement Area No. 1 and the Pristine Mangrove area.

Slough Area

The slough area is approximately 16.5 acres in size. Desirable species originally on site included *Conocarpus erectus, Acrostichum danaeifolium, Rhizophora mangle, Avicennia germinans, Laguncularia racemosa, Cladium jamaiscense* and *Paspalum vaginatum*. Prior to enhancement by nuisance removal, approximately 65% (10.7± acres) of the site was dominated by *Casuarina litorea* and *Schinus terebinthifolius, Typha sp., Ludwigia peruviana* and *Mikania scandens* were also present.

Manual removal of the nuisance and exotic species was performed, with the expectations that natural recruitment by desirable species would occur.

Clearing of the nuisance/exotic species within the Slough Area was performed as follows:

1. Mechanical equipment was utilized only in those areas where nuisance/exotic vegetation exceeded 75% coverage.
2. Any significant natural features found within the areas mechanically cleared were left as they were found.
3. The areas which were mechanically cleared were re-graded to restore the area to natural grade.
4. *Casuarina litorea* were cut, removed, and stump treated. In areas where removal might cause damage, the tree was girdled, sprayed, and left in place.
5. *Schinus terebinthifolius* on site were cut, removed, and stump treated.
6. *Panicum repens* and *Typha sp.* were treated with herbicide when found on site.
7. Wind thrown material was removed from the Slough manually.
8. All man-made litter was removed manually.
9. All material removed from the Slough area was properly disposed of.
10. No native vegetation was damaged during this maintenance event.

Canopy cover increased nicely in this area, from 27% to 41%. *Conocarpus erectus,* the dominant canopy species, actually decreased in cover slightly, from 27% to 25%, but *Laguncularia racemosa* increased from 8% to 16%. No nuisance canopy species were found in any of the quadrats.

Desirable shrub species coverage decreased from 29% to 18%, due partly to some of the species achieving canopy classification. *Conocarpus erectus* dominates, at 10%, down from 12%, with *Acrostichum* sp. estimated at 7%, down from 8%. *Laguncularia racemosa* adds 1% desirable cover, with an unidentified shrub at <1%. No nuisance shrub species were present in the sampled areas.

Desirable herbaceous species coverage decreased from 53% to 41%. *Cladium jamaiscense* remains dominant, at 21%% cover, down from 29%. *Eleocharis cellulosa* adds 9% cover, with *Andropogon* sp. each estimated at 6%. *Laguncularia racemosa* adds 2% cover, with *Acrostichum* sp. and Rhabdadenia biflora adding 1% each.

Fimbristylis sp. and *Distichlis spicata* are estimated at <1% cover each.

Typha sp. and *Mikania scandens* were the two nuisance species once again found in the sampled areas, at <1% cover each.

Two additional nuisance species were found on site, but outside the sampled areas: *Schinus terebinthifolius* and *Ricinus communis*.

Enhancement Area No. 1

Excavation of Area 1 occurred between March 3, 2000 and March 15, 2001. Backfill, utilizing limerick and top soil occurred between June 5, 2000 and May 4, 2001. The following species and quantities were installed between June 1 and June 15, 2001.

Species	Test Plot: #1	#2	#3	Size
Avicennia germinans	20	30	50	1 gal.
Conocarpus erectus	20	30	50	"
Ilex cassine	40	60	100	"
Laguncularia racemosa	20	30	50	"
Persea borbonia	40	60	100	"
Rhizophora mangle	20	30	50	"
Salix caroliniana	60	90	150	"
Borrichia arborescens	40	60	100	1 gal.
Iva frutescens	40	60	100	"
Lycium carolinianum	40	60	100	"
Myrica cerifera	40	60	100	"
Acrostichum aureum	60	90	150	2" liner
Acrostichum danaeifolium	200	300	500	"
Andropogon glomeratus	600	900	1500	"
Batis maritima	340	510	850	"
Cladium jamaiscense	1500	2250	3750	"
Distichlis spicata	1400	2100	3500	"
Fimbristylis castanea	380	570	950	"
Eleocharis cellulosa	400	600	1000	"
Juncus roemerianus	800	1200	2000	"
Salicornia spp.	400	600	1000	"
Solidago stricta	200	300	500	"
Spartina spartinae	1400	2100	3500	"

The one gallon species were installed on approximately 14 foot centers; the 2" liners were installed on three foot centers.

Area One has a total of thirty-nine (39) quadrat sampling stations along the three transects running through the system. An aggressive maintenance plan has been implemented to minimize nuisance species presence and coverage. During this monitoring event, nuisance species once again accounted for approximately 2% coverage throughout the area, unchanged since the previous event. Additional nuisance species were found on site, outside the sampled areas, and included *Vigna luteola, Phragmites sp.,* and *Ricinus communis*.

While four canopy species were again found within the sampled areas, coverage has increased significantly. Total desirable canopy cover is estimated at 14%, up from 9% previously. *Baccharis* spp. again dominate, at 7% cover, up from 6%. *Conocarpus erectus* is estimated at 4% cover, with *Rhizophora mangle* at 1%. No nuisance canopy species were present.

Shrub diversity remains unchanged at this time, with six species present, but desisrable coverage has increased from 19% to 23%. *Conocarpus erectus* is dominant, at 10% cover, with *Baccharis halimifolia* and *Acrostichum* sp. at 4% each. *Rhizophora mangle* is estimated at 2% cvoer, with *Laguncularia racemosa* adding 1%. No nuisance shrub species were found in any of the sampled areas.

Distichlis spicata is once again the dominant desirable groundcover on site, estimated at 16% cover, down from 19%. *Eleocharis cellulosa* increased in coverage from 11% to 13%, with *Cladium jamaiscense* estimated at 11%, down from 12%. *Fimbristylis* spp. add 9% cover, with *Bacopa monnieri* and *Panicum* sp. accounting for 7% cover each. *Conocarpus erectus* adds 4% cover, with six additional desirable species adding 2% cover or less. Total desirable herbaceous species coverage is estimated at 72%, down from 76%. *Pluchea rosea, Erigeron sp., Andropogon sp., Solidago sp., Pluchea carolinensis* and *Ipomoea* sp. are also present, but not in the sampled areas.

The berm areas east and west of Area One are filling in well at this time. *Eleocharis atropurpurea, eleocharis cellulosa, Fimbristylis* sp., *Bacopa monnieri, distichlis spicata, Rhabdadenia biflora, Eragrostis* sp., *Solidago* sp., *Erigeron* sp., *Andropogon* sp., *Pluchea rosea, Pluchea carolinensis, Laguncularia racemosa, Conocarpus erectus* and *Baccharis* spp. were all present.

Pristine Mangrove Area

The monitored site is approximately forty (40) acres in size, and consists mainly of an existing, undisturbed wetland community, dominated by mangroves and buttonwood.

The Pristine Mangrove Area has a total of fifteen (15) quadrat stations along the three transect lines. This system appears to be faring well overall, with minimal nuisance sepcies presence.

The canopy is more dense along the western and northern perimeters of the site, with shrub cover more dominant in the central and eastern portions. Herbaceous species are more prevalent in the central portion also, due to the lack of dense canopy.

Desirable canopy cover decreased from 5% to 4%, with *Conocarpus erectus* the one canopy species found in the sampled areas. No other canopy species were found within the sampled areas, either desirable or nuisance/exotic.

Desirable shrub species cover decreased also, from 26% to 15%. *Conocarpus erectus* decreased in shrub cover, from 20% to 8%, with *Rhizophora mangle* adding 7% cover, up from 6%. The decrease in shrub coverage may be due to storm damage from the hurricanes.

Desirable ground cover decreased from 67% to 59%. *Rhizophora mangle* dominates, at 20% cover, with *Conocarpus erectus* estimated at 17%. *Fimbristylis* spp. add 15% cvoer, with *Juncus roemerianus* at 5% and *Eleocharis cellulosa* estimated at 1% cvoer. *Rhabdadenia biflora* and *Borrichea frutescens* add <1% cover each. No nuisance species were found in the sampled areas.

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Monitoring Methodology

Data is collected along the three transects, at set quadrats. Data collected includes ground cover (0-3'), shrub cover (3-6') and tree cover (6'+). Transect locations, with approximate quadrat sampling stations, as well as photo point locations, are shown on the enclosed site plan.

Salinity, conductivity, pH, dissolved oxygen, water temperature and depth are to be measured at the beginning and end of each transect, at the ecotone between each area (slough, wetland restoration area and pristine mangrove area), and every thirty (30) meters. These tests will be run whenever water is present along the transects.

Photographs of each transect, utilizing a range pole, will be taken at the ends of each transect. Additional photo points are indicated on the attached site plan.

Species found within the sampled areas will be listed, with dominance, frequency and coverage percentages. Species diversity, including desirable and undesirable/nuisance species, is included.

Wildlife utilization will also be noted.

A narrative describing any remedial activities undertaken or recommended will also be included in the report.

Calculation Formulas

Relative Frequency = (frequency of species X/ Total frequency for all species)(100%)

Density- (for quadrat method)

$D_x = N_x / a$

where: D_x = density of species x (no. per m^2 or ft^2)
N_x = No. of plants of species x
a = area of plot

Cover (%)- (for quadrat method)

$Cx = (\sum C_q / N_q)(100\%)$

where: Cx = cover of species x (%)
$\sum C_q$ = Total coverage by species x in all sampled quadrats
N_q = No. of quadrats sampled

Diversity- (Simpson Index)

$D = 1 / \sum P_i^2$

where: D = Diversity
S = Number of species
P_i = Proportion of the ith species

Species Richness- the total number of species at any particular site.

Evenness- (Simpson Index)

$E = D/S$

where: E = Evenness
D = Diversity as determined by the Simpson Index
S = number of species

Water Samples

With the water depth at approximately 4" in some portions of the area, water sampling was not feasible.

Wildlife

Little blue herons, unidentified hawks, killdeer, a great blue heron, great egret, snowy egret, white ibis, vultures, green heron, raccoon tracks, as well as various trails and bedding sites, were seen during this monitoring event. A crocodile was seen in the canal north of Area One.

Slough Area

Canopy cover increased nicely in this area, from 27% to 41%. *Conocarpus erectus,* the dominant canopy species, actually decreased in cover slightly, from 27% to 25%, but *Laguncularia racemosa* increased from 8% to 16%. No nuisance canopy species were found in any of the quadrats.

Desirable shrub species coverage decreased from 29% to 18%, due partly to some of the species achieving canopy classification. *Conocarpus erectus* dominates, at 10%, down from 12%, with *Acrostichum* sp. estimated at 7%, down from 8%. *Laguncularia racemosa* adds 1% desirable cover, with an unidentified shrub at <1%. No nuisance shrub species were present in the sampled areas.

Desirable herbaceous species coverage decreased from 53% to 41%. *Cladium jamaiscense* remains dominant, at 21%% cover, down from 29%. *Eleocharis cellulosa* adds 9% cover, with *Andropogon* sp. each estimated at 6%. *Laguncularia racemosa* adds 2% cover, with *Acrostichum* sp. and Rhabdadenia biflora adding 1% each. *Fimbristylis* sp. and *Distichlis spicata* are estimated at <1% cover each.

Typha sp. and *Mikania scandens* were the two nuisance species once again found in the sampled areas, at <1% cover each.

Two additional nuisance species were found on site, but outside the sampled areas: *Schinus terebinthifolius* and *Ricinus communis.*

SLOUGH AREA

TRANSECT #1

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	60%	60%	36%	65%
Laguncularia racemosa	40%	40%	19%	35%

Species richness: 2

Undesirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	40%	67%	21%	95%
Laguncularia racemosa	20%	33%	1%	5%

Species richness: 2

Undesirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Cladium jamaiscense	60%	38%	38%	80%
Acrostichum sp.	20%	12%	1%	2%
Fimbristylis sp.	20%	12%	2%	4%
Eleocharis cellulosa	20%	12%	4%	9%
Rhabdadenia biflora	20%	12%	2%	4%

Species richness: 5

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Typha sp.	20%	12%	1%	2%

Species richness: 1

SLOUGH AREA

TRANSECT #1

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	1.92	1.79	4.62
Evenness	0.96	0.90	0.77
Richness	2	2	6

Laguncularia racemosa and *Conocarpus erectus* remain the two canopy species. Two desirable shrub species were present, down from three. No nuisance canopy or shrub species were present. Five desirable herbaceous species were present, up from four; one nuisance herbaceous species was again found, unchanged since the previous event.

SLOUGH AREA

TRANSECT #2

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	60%	75%	44%	79%
Laguncularia racemosa	20%	25%	12%	21%

Species richness: 2

Undesirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	40%	50%	5%	19%
Acrostichum sp.	20%	25%	20%	77%
Laguncularia racemosa	20%	25%	1%	4%

Species richness: 3

Undesirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Cladium jamaiscense	80%	50%	28%	76%
Laguncularia racemosa	20%	12%	5%	14%
Acrostichum sp.	20%	12%	2%	5%
Distichlis spicata	20%	12%	2%	5%
Rhabdadenia biflora	20%	12%	<1%	<1%

Species richness: 5

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

SLOUGH AREA

TRANSECT #2

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	1.60	2.67	3.25
Evenness	0.80	0.89	0.65
Richness	2	3	5

No nuisance species were found in any of the sampled areas along this transect. Two desirable canopy species were again found; three desirable shrub species were present, unchanged since the previous event; five desirable herbaceous species were present, also unchanged.

SLOUGH AREA

TRANSECT #3

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	25%	50%	8%	31%
Laguncularia racemosa	25%	50%	18%	69%

Species richness: 2

Undesirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	50%	50%	9%	75%
Laguncularia racemosa	25%	25%	2%	17%
Unidentified shrub	25%	25%	1%	8%

Species richness: 3

Undesirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Andropogon sp.	40%	33%	22%	51%
Eleocharis cellulosa	40%	33%	20%	47%
Rhabdadenia biflora	20%	17%	1%	2%

Species richness: 3

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Mikania scandens	20%	17%	<1%	<1%

Species richness: 1

SLOUGH AREA

TRANSECT #3

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	2.0	2.67	3.63
Evenness	1.0	0.89	0.91
Richness	2	3	4

Laguncularia racemosa and *Conocarpus erectus* again constitute the canopy species. Three desirable shrub species were present, up from two. Three desirable herbaceous species were present, down from five. One nuisance species was present, unchanged from the previous event.

SLOUGH AREA

FREQUENCY/AVG. COVER FOR ALL SPECIES FOUND ON SITE

Canopy Species	Frequency	Average Coverage on Site
Conocarpus erectus	50%	25%
Laguncularia racemosa	29%	16%
	Total	**41% (up from 35%)**
Shrub Species		
Conocarpus erectus	43%	10%
Acrostichum spp.	14%	7%
Unidentified shrub	14%	<1%
Laguncularia racemosa	14%	1%
	Total Desirable	**18% (down from 29%)**
	Nuisance	**0% (down from <1%)**
Ground Cover		
Cladium jamaiscense	57%	21%
Andropogon spp.	14%	6%
Laguncularia racemosa	7%	2%
Eleocharis cellulosa	21%	9%
Fimbristylis spp.	7%	<1%
Acrostichum sp.	14%	1%
Distichlis spicata	7%	<1%
Rhabdadenia biflora	21%	1%
Typha sp.	**7%**	**<1%**
Mikania scandens	**7%**	**<1%**
	Total Desirable	**41% (down from 53%)**
	Nuisance	**<1% (Unchanged))**

Species richness:

Canopy: 2 desirable species, 0 nuisance/undesirable species
Shrub: 4 desirable species, 0 nuisance/undesirable species
Ground cover: 8 desirable species, 2 nuisance/undesirable species

Bold species are nuisance/exotic/undesirable species

Enhancement Area No. 1

Area One has a total of thirty-nine (39) quadrat sampling stations along the three transects running through the system. An aggressive maintenance plan has been implemented to minimize nuisance species presence and coverage. During this monitoring event, nuisance species once again accounted for approximately 2% coverage throughout the area, unchanged since the previous event. Additional nuisance species were found on site, outside the sampled areas, and included *Vigna luteola*, *Phragmites sp.*, and *Ricinus communis*.

While four canopy species were again found within the sampled areas, coverage has increased significantly. Total desirable canopy cover is estimated at 14%, up from 9% previously. *Baccharis* spp. again dominate, at 7% cover, up from 6%. *Conocarpus erectus* is estimated at 4% cover, with *Rhizophora mangle* at 1%. No nuisance canopy species were present.

Shrub diversity remains unchanged at this time, with six species present, but desirable coverage has increased from 19% to 23%. *Conocarpus erectus* is dominant, at 10% cover, with *Baccharis halimifolia* and *Acrostichum* sp. at 4% each. *Rhizophora mangle* is estimated at 2% cover, with *Laguncularia racemosa* adding 1%. No nuisance shrub species were found in any of the sampled areas.

Distichlis spicata is once again the dominant desirable groundcover on site, estimated at 16% cover, down from 19%. *Eleocharis cellulosa* increased in coverage from 11% to 13%, with *Cladium jamaiscense* estimated at 11%, down from 12%. *Fimbristylis* spp. add 9% cover, with *Bacopa monnieri* and *Panicum* sp. accounting for 7% cover each. *Conocarpus erectus* adds 4% cover, with six additional desirable species adding 2% cover or less. Total desirable herbaceous species coverage is estimated at 72%, down from 76%. *Pluchea rosea, Erigeron sp., Andropogon sp., Solidago sp., Pluchea carolinensis* and *Ipomoea* sp. are also present, but not in the sampled areas.

The berm areas east and west of Area One are filling in well at this

time. *Eleocharis atropurpurea, Eleocharis cellulosa, Fimbristylis* sp., *Bacopa monnieri, distichlis spicata, Rhabdadenia biflora, Eragrostis* sp., *Solidago* sp., *Erigeron* sp., *Andropogon* sp., *Pluchea rosea, Pluchea carolinensis, Laguncularia racemosa, Conocarpus erectus* and *Baccharis* spp. were all present.

Nuisance species include *Smilax auriculata, Typha* sp. and *Vigna luteola*, at a total of 2% cover. Nuisance species coverage has remained fairly low in the sampled areas. Additional nuisance species found on site included *Wedelia trilobata* (mainly in southwest corner)

AREA ONE

TRANSECT #1

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Laguncularia racemosa	13%	40%	9%	78%
Conocarpus erectus	6%	20%	<1%	5%
Baccharis sp.	13%	40%	2%	17%

Species richness: 3

Undesirable Canopy cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	13%	40%	8%	64%
Baccharis sp.	13%	40%	<1%	4%
Laguncularia racemosa	6%	20%	4%	32%

Species richness: 3

Undesirable Shrub cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Distichlis spicata	44%	23%	34%	38%
Bacopa monnieri	25%	13%	13%	14%
Eleocharis cellulosa*	38%	20%	20%	22%
Fimbristylis sp.	13%	7%	10%	11%
Panicum sp.	25%	13%	12%	13%
Scirpus americanus	6%	3%	1%	1%
Salicornia sp.	6%	3%	<1%	<1%
Rhabdadenia biflora	6%	3%	<1%	<1%

Species richness: 8

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Vigna luteola	19%	10%	3%	3%
Typha sp.	6%	3%	1%	1%

Species richness: 2

AREA ONE

TRANSECT #1

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	2.78	2.78	7.40
Evenness	0.93	0.93	0.74
Richness	3	3	10

Three desirable canopy species are present, up from one. Three desirable shrub species were present, unchanged. Nuisance species were not present in the canopy or shrub strata. Of the ten herbaceous ground cover species found, eight are desirable (80%), two are nuisance species (20%).

AREA ONE

TRANSECT #2

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	38%	60%	22%	71%
Rhizophora mangle	25%	40%	9%	29%

Species richness: 2

Undesirable Canopy cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	38%	43%	28%	61%
Rhizophora mangle	38%	43%	17%	37%
Laguncularia racemosa	13%	14%	1%	2%

Species richness: 3

Undesirable Shrub cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Eleocharis cellulosa	50%	28%	27%	47%
Distichlis spicata	25%	14%	7%	12%
Conocarpus erectus	13%	7%	3%	5%
Fimbristylis sp.	13%	7%	7%	12%
Bacopa monnieri	25%	14%	4%	7%
Baccharis sp.	13%	7%	1%	2%
Panicum sp.	25%	14%	7%	12%

Species richness: 7

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Smilax auriculata	13%	7%	2%	3%

Species richness: 1

AREA ONE

TRANSECT #2

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	1.92	2.57	6.38
Evenness	0.96	0.86	0.78
Richness	2	3	8

Two canopy species were again present along this transect, unchanged. No nuisance canopy species were present. A total of three desirable shrub species are present; down from four. No nuisance shrub species were present. Seven desirable herbaceous species were found (88%); one nuisance species was found (12%).

AREA ONE

TRANSECT #3

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Baccharis sp.	26%	70%	16%	89%
Conocarpus erectus	11%	30%	2%	11%

Species richness: 2

Undesirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Acrostichum sp.	11%	21%	4%	17%
Baccharis augustifolia	5%	9%	3%	13%
Baccharis halimifolia	11%	21%	6%	26%
Conocarpus erectus	26%	49%	10%	43%

Species richness: 4

Undesirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Cladium jamaiscense	32%	14%	24%	30%
Bacopa monnieri	21%	9%	4%	5%
Fuirena spp.	32%	21%	9%	12%
Distichlis spicata	21%	9%	11%	14%
Eleocharis cellulosa	26%	8%	9%	12%
Eragrostis sp.	5%	2%	2%	3%
Acrostichum sp.	11%	5%	4%	5%
Conocarpus erectus	16%	7%	7%	9%
Panicum sp.	21%	9%	4%	5%
Rhabdadenia biflora	11%	5%	1%	1%

Species richness: 10

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Smilax auriculata	26%	8%	3%	4%

Species richness: 1

AREA ONE

TRANSECT #3

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	1.72	2.97	9.00
Evenness	0.86	0.74	0.82
Richness	2	4	11

Two desirable canopy species are once again present, unchanged since the previous event. The same four desirable shrub species are again present; no nuisance canopy or shrub species were present. Of the eleven herbaceous species found in the sampled quadrats, ten (91%) are considered desirable species and one (9%) is considered nuisance or exotic species.

AREA ONE

FREQUENCY/AVG. COVER FOR ALL SPECIES FOUND ON SITE

Canopy species	Frequency	Average Coverage on Site
Laguncularia racemosa	5%	2%
Conocarpus erectus	14%	4%
Baccharis sp.	15%	7%
Rhizophora mangle	5%	1%
		Total: 14% (up from 9%)
Shrub Species		
Baccharis halimifolia	9%	4%
Baccharis angustifolia	7%	2%
Conocarpus erectus	23%	10%
Rhizophora mangle	7%	2%
Acrostichum sp.	7%	4%
Laguncularia racemosa	5%	1%
		Total: 23% (Up from 19%)
Ground Cover		
Cladium jamaiscense*	14%	11%
Distichlis spicata*	26%	16%
Bacopa monnieri	23%	7%
Eragrostis sp.	2%	<1%
Fimbristylis sp.	21%	9%
Acrostichum spp.*	5%	1%
Eleocharis cellulosa*	37%	13%
Fuirena spp.	2%	2%
Scirpus americanus	2%	<1%
Conocarpus erectus	14%	4%
Rhabdadenia biflora	7%	<1%
Panicum sp.	23%	7%
Salicornia sp.	2%	<1%
Smilax auriculata	**14%**	**1%**
Vigna luteola	**7%**	**<1%**
Typha sp.	**2%**	**<1%**
		Total Desirable: 72%+ (down from 76%)
		Nuisance: 2% (Unchanged)

Species richness:

Canopy: 4 desirable species, o nuisance species
Shrub: 6 desirable species, 0 nuisance/undesirable species
Ground cover: 13 desirable species, 3 nuisance/undesirable species

Bold species are nuisance/exotic/undesirable species

*Installed species

*Installed species account for 41% (down from 42%%) of the total desirable species coverage. Recruited desirable species account for 30% (down from 34%), for a total desirable species coverage of 72% (down from 76%).

Pristine Mangrove Area

The monitored site is approximately forty (40) acres in size, and consists mainly of an existing, undisturbed wetland community, dominated by mangroves and buttonwood.

The Pristine Mangrove Area has a total of fifteen (15) quadrat stations along the three transect lines. This system appears to be faring well overall, with minimal nuisance species presence.

The canopy is more dense along the western and northern perimeters of the site, with shrub cover more dominant in the central and eastern portions. Herbaceous species are more prevalent in the central portion also, due to the lack of dense canopy.

Desirable canopy cover decreased from 5% to 4%, with *Conocarpus erectus* the one canopy species found in the sampled areas. No other canopy species were found within the sampled areas, either desirable or nuisance/exotic.

Desirable shrub species cover decreased also, from 26% to 15%. *Conocarpus erectus* decreased in shrub cover, from 20% to 8%, with *Rhizophora mangle* adding 7% cover, up from 6%. The decrease in shrub coverage may be due to storm damage from the hurricanes.

Desirable ground cover decreased from 67% to 59%. *Rhizophora mangle* dominates, at 20% cover, with *Conocarpus erectus* estimated at 17%. *Fimbristylis* spp. add 15% cover, with *Juncus roemerianus* at 5% and *Eleocharis cellulosa* estimated at 1% cover. *Rhabdadenia biflora* and *Borrichia frutescens* add <1% cover each. No nuisance species were found in the sampled areas.

PRISTINE MANGROVE AREA

TRANSECT #1

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Undesirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	20%	100%	9%	100%

Species richness: 1

Undesirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Rhizophora mangle	60%	21%	10%	14%
Conocarpus erectus	100%	36%	27%	37%
Fimbristylis sp.	80%	29%	18%	25%
Juncus roemerianus	20%	7%	15%	21%
Eleocharis cellulosa	20%	7%	3%	4%

Species richness: 5

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	0	1.0	3.74
Evenness	0	1.0	0.75
Richness	N/a	1	5

No canopy species were present. *Conocarpus erectus* is the one shrub species present. Five desirable herbaceous species were found, up from four. No nuisance species were present.

PRISTINE MANGROVE AREA

TRANSECT #2

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	20%	100%	6%	100%

Species richness: 1

Undesirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	20%	33%	11%	58%
Rhizophora mangle	40%	67%	8%	42%

Species richness: 2

Undesirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Rhizophora mangle	100%	42%	28%	40%
Conocarpus erectus	40%	17%	14%	20%
Fimbristylis spp.	80%	33%	28%	40%
Borrichia frutescens	20%	8%	<1%	<1%

Species richness: 4

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	1.0	1.79	3.12
Evenness	1.0	0.90	0.78
Richness	1	2	4

No nuisance species were found in the sampled areas. *Conocarpus erectus* remains the only canopy species found, with *Conocarpus* sp. and *Rhizophora* mangle again the two desirable shrub species. Four desirable herbaceous ground cover species were found; down from five previously.

PRISTINE MANGROVE AREA

TRANSECT #3

Desirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Conocarpus erectus	40%	100%	8%	100%

Species richness: 1

Undesirable Canopy Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Rhizophora mangle	60%	60%	15%	79%
Conocarpus erectus	40%	40%	4%	21%

Species richness: 2

Undesirable Shrub Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

Desirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
Rhizophora mangle	100%	50%	23%	67%
Conocarpus erectus	60%	30%	10%	29%
Borrichia frutescens	20%	10%	<1%	1%
Rhabdadenia biflora	20%	10%	1%	3%

Species richness: 4

Undesirable Ground Cover

Species	Frequency	Rel. Frequency	Coverage	Relative Coverage
None	0%	0%	0%	0%

Species richness: 0

	Canopy spp.	Shrub spp.	Ground Cover spp.
Diversity	1.00	1.92	2.78
Evenness	1.00	0.96	0.69
Richness	1	2	4

No nuisance species were found in the sampled areas. One desirable canopy species and two shrub species were found, with four desirable herbaceous species, all unchanged since the previous event.

PRISTINE MANGROVE AREA

FREQUENCY/AVG. COVER FOR ALL SPECIES FOUND ON SITE

Canopy Species	Frequency	Average Coverage on Site
Conocarpus erectus	20%	4%
	Total:	**4% (down from 5%)**
Shrub Species		
Conocarpus erectus	27%	8%
Rhizophora mangle	33%	7%
	Total	**15% (down from 26%)**
Ground Cover		
Rhizophora mangle	87%	20%
Conocarpus erectus	67%	17%
Fimbristylis spp.	53%	15%
Borrichia frutescens	13%	<1%
Juncus roemerianus	7%	5%
Eleocharis cellulosa	7%	1%
Rhabdadenia biflora	7%	<1%
	Total:	**59% (Down from 67%)**

Species richness:

Canopy: 1 desirable species, 0 nuisance/undesirable species
Shrub: 2 desirable species, 0 nuisance/undesirable species
Ground cover: 7 desirable species, 0 nuisance/undesirable species

SLOUGH AREA

TRANSECT #1

Desirable Canopy Cover

Species	Percent Cover
Conocarpus erectus	36%
Laguncularia racemosa	19%

Total: 55% Species richness: 2

Undesirable Canopy Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Conocarpus erectus	21%
Laguncularia racemosa	1%

Total: 22%+ Species richness: 2

Undesirable Shrub Cover

Species	Percent Cover
None	0%

Total: 0% Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Cladium jamaiscense	38%
Acrostichum sp.	1%
Fimbristylis sp.	2%
Eleocharis cellulosa	4%
Rhabdadenia biflora	2%

Total: 47% Species richness: 5

Undesirable Ground Cover

Species	Percent Cover
Typha sp.	1%

Total: 1% Species richness: 1

SLOUGH AREA

TRANSECT #2

Desirable Canopy Cover

Species	Percent Cover
Conocarpus erectus	44%
Laguncularia racemosa	12%

Total: 56% Species richness: 2

Undesirable Canopy Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Conocarpus erectus	5%
Acrostichum sp.	20%
Laguncularia racemosa	1%

Total: 26% Species richness: 3

Undesirable Shrub Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Cladium jamaiscense	28%
Laguncularia racemosa	5%
Acrostichum sp.	2%
Distichlis spicata	2%
Rhabdadenia biflora	<1%

Total: 37% Species richness: 5

Undesirable Ground Cover

Species	Percent Cover
None	0%

Total: 0% Species richness: 0

SLOUGH AREA

TRANSECT #3

Desirable Canopy Cover

Species	Percent Cover
Conocarpus erectus	8%
Laguncularia racemosa	18%

Total: 26% Species richness: 2

Undesirable Canopy Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Conocarpus erectus	9
Laguncularia racemosa	2
Unidentified shrub	1

Total: 12% Species richness: 3

Undesirable Shrub Cover

Species	Percent Cover
None	0%

Total: 0% Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Andropogon virginicus	22%
Eleocharis cellulosa	20%
Rhabdadenia biflora	1%

Total: 43% Species richness: 3

Undesirable Ground Cover

Species	Percent Cover
Mikania scandens	<1%

Total: <1% Species richness: 1

AREA ONE

TRANSECT #1

Desirable Canopy Cover

Species	Percent Cover
Laguncularia racemosa	9%
Conocarpus erectus	<1%
Baccharis sp.	2%
Total:	11% Species richness: 3

Undesirable Canopy cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Conocarpus erectus	8%
Baccharis sp.	<1%
Laguncularia racemosa	4%
Total:	12% Species richness: 3

Undesirable Shrub cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Distichlis spicata*	34%
Bacopa monnieri	13%
Eleocharis cellulosa*	20%
Fimbristylis sp.	10%
Panicum sp.	12%
Scirpus americanus	1%
Salicornia sp.	<1%
Rhabdadenia biflora	<1%
Total:	90% Species richness: 8

*Installed species: 54%, up from 44% coverage;
recruited species: 27%, down from 38% coverage

Undesirable Ground Cover

Species	Percent Cover
Vigna luteola	3%
Typha sp.	1%
Total:	4% Species richness: 2

AREA ONE

TRANSECT #2

Desirable Canopy Cover

Species	Percent Cover
Conocarpus erectus	22%
Rhizophora mangle	9%

Total: 31% Species richness: 2

Undesirable Canopy cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Conocarpus erectus	28%
Rhizophora mangle	17%
Laguncularia racemosa	1%

Total: 46% Species richness: 3

Undesirable Shrub cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Eleocharis cellulosa*	27%
Distichlis spicata*	7%
Conocarpus erectus	3%
Fimbristylis sp.	7%
Bacopa monnieri	4%
Baccharis sp.	1%
Panicum spp.	7%

Total: 56% Species richness: 7

*Installed species: 34%, down from 38% coverage;
Recruited species: 22%, up from 19%

Undesirable Ground Cover

Species	Percent Cover
Smilax auriculata	2%

Total: 2% Species richness: 1

AREA ONE

TRANSECT #3

Desirable Canopy Cover

Species	Percent Cover
Baccharis sp.	16%
Conocarpus erectus	2%

Total: 18% Species richness: 2

Undesirable Canopy cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Acrostichum sp.	4%
Baccharis augustifolia	3%
Baccharis halimifolia	6%
Conocarpus erectus	10%

Total: 23% Species richness: 4

Undesirable Shrub Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Cladium jamaiscense*	24%
Bacopa monnieri	4%
Fuirena spp.	9%
Distichlis spicata*	11%
Eleocharis cellulosa	9%
Eragrostis sp.	2%
Acrostichum sp.*	4%
Conocarpus erectus	7%
Panicum sp.	4%
Rhabdadenia biflora	1%

Total: 75% Species richness: 10

*Installed species: 37%, up from 32% coverage;
recruited species: 38%, up from 31%

Undesirable Ground Cover

Species	Percent Cover
Smilax auriculata	3%

Total: 3% Species richness: 1

PRISTINE MANGROVE AREA

TRANSECT #1

Desirable Canopy Cover

Species	Percent Cover
None	0%

Species richness: 0

Undesirable Canopy Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Conocarpus erectus	9%

Total: 9% Species richness: 1

Undesirable Shrub Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Rhizophora mangle	10%
Conocarpus erectus	27%
Fimbristylis spp.	18%
Juncus roemerianus	15%
Eleocharis cellulosa	3%

Total: 73% Species richness: 5

Undesirable Ground Cover

Species	Percent Cover
None	0%

Species richness: 0

PRISTINE MANGROVE AREA

TRANSECT #2

Desirable Canopy Cover

Species	Percent Cover
Conocarpus erectus	5%

Total: 5% Species richness: 1

Undesirable Canopy Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Conocarpus erectus	11%
Rhizophora mangle	8%

Total: 19% Species richness: 2

Undesirable Shrub Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Ground Cover

Species	Percent Cover
Rhizophora mangle	28%
Conocarpus erectus	14%
Fimbristylis spp.	28%
Borrichia frutescens	<1%

Total: 70%+ Species richness: 4

Undesirable Ground Cover

Species	Percent Cover
None	0%

Species richness: 0

PRISTINE MANGROVE AREA

TRANSECT #3

Desirable Canopy Cover

Species	Percent Cover
Conocarpus erectus	8%

Total: 8% Species richness: 1

Undesirable Canopy Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Shrub Cover

Species	Percent Cover
Rhizophora mangle	15%
Conocarpus erectus	4%

Total: 19% Species richness: 2

Undesirable Shrub Cover

Species	Percent Cover
None	0%

Species richness: 0

Desirable Ground Cover

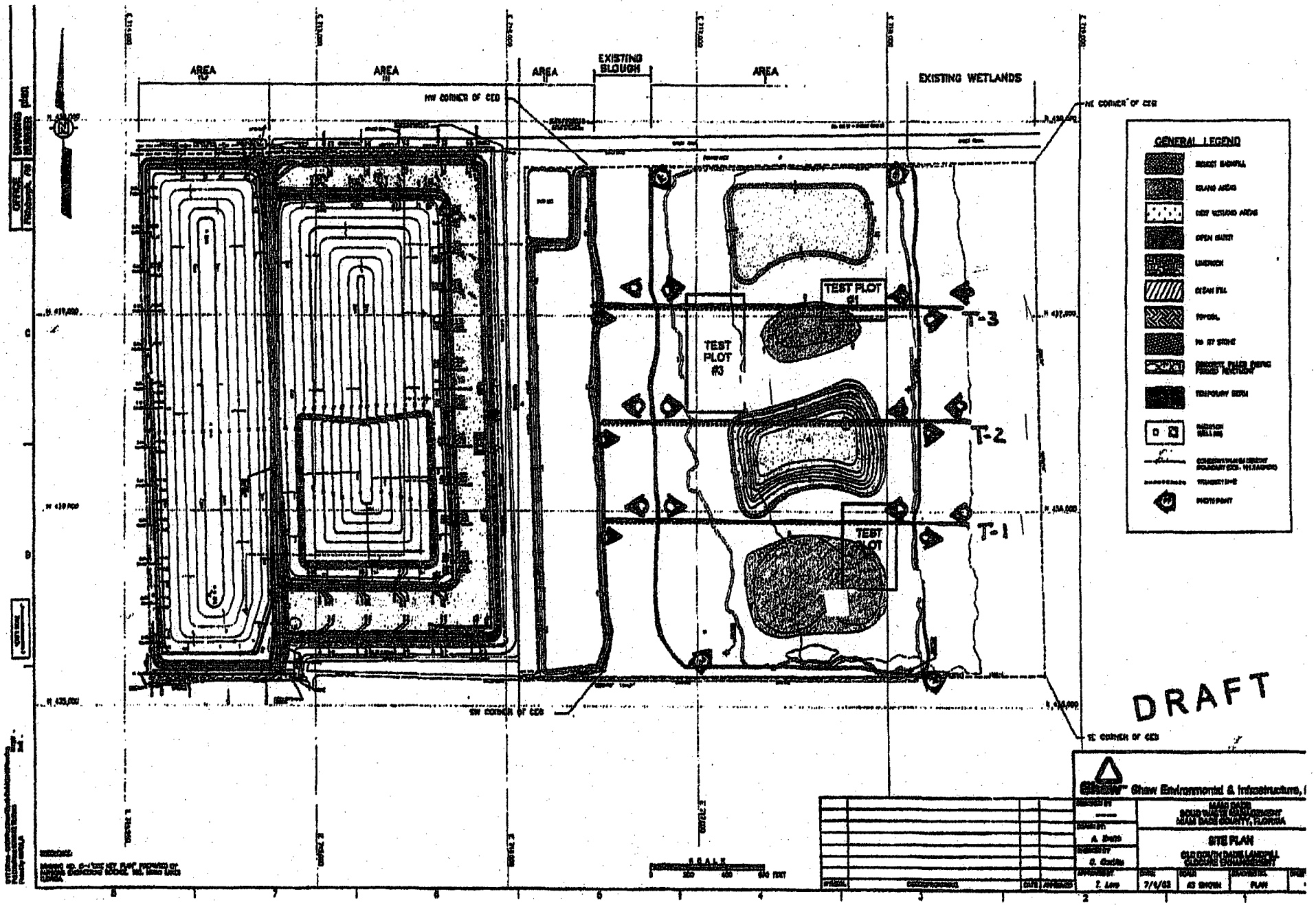
Species	Percent Cover
Rhizophora mangle	23%
Conocarpus erectus	10%
Borrichia frutescens	<1%
Rhabdadenia biflora	1%

Total: 34%+ Species richness: 4

Undesirable Ground Cover

Species	Percent Cover
None	0%

Species richness: 0



T-TRANSECT

PHOTO POINT

SLOUGH AREA PHOTOGRAPHS

Transect #1, West End

Transect #1, East End

Transect #2, West End

Transect #2, East End

Transect #3, West End

Transect #3, East End

AREA ONE PHOTOGRAPHS

Northwest Corner

Northeast Corner

Southeast Corner

Southwest Corner

Transect #1, West End

Transect #1, East End

Transect #2, West End

Transect #2, East End

Transect #3, West End

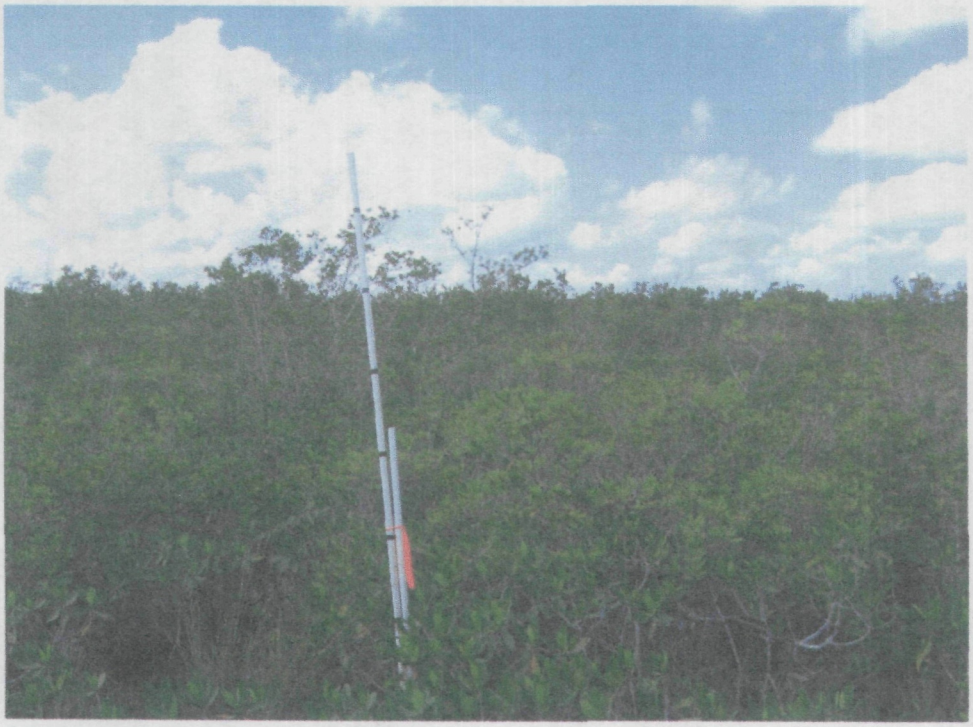
Transect #3, East End

PRISTINE MANGROVE AREA PHOTOGRAPHS

Transect #1, West End

Transect #1, East End

Transect #2, West End



Transect #2, East End

Transect #3, West End

Transect #3, East End