Coast 2050 Region 1

BAYOU SAUVAGE HYDROLOGIC RESTORATION (PO-16)
PO-16-MSPR-0597-2
PROGRESS REPORT No. 2
for the period
May 1, 1996 to May 4, 1997

Project Status

The following data collection and analysis activities have been conducted since the previous progress report. Water quality variables were collected at one continuous recorder site in the north unit of the project area (PO16-01) from July 13, 1996 through November 12, 1996, and at one site in the reference area (PO16-12R) from July 13, 1996 through January 22, 1997 (figures 1 and 2). Staff gauge readings were collected from one station in the north unit (PO16-01) and one station in the south unit (PO16-04) from January 6, 1997 through February 20, 1997 (table 1). Six additional staff gauges were established in both units of the project area and the reference area in February 1997. The three original staff gauges were surveyed to NGVD, therefore data in this report is presented in NGVD. All nine staff gauges were surveyed to North American Vertical Datum (NAVD) 1988 by U.S. Fish and Wildlife Service (USFWS) personnel in February 1997. Weekly readings were collected from a total of three staff gauges in the north unit of the project area, two gauges in the south unit of the project area, and three staff gauges in the reference area from February 20, 1997 through March 31, 1997 (table 1).

Although staff gauges have been installed, marsh sediment elevation has not been established at this time. Due to small data sets related to delays associated with installation of staff gauges, no further analyses have been conducted for this progress report. Marsh sediment elevation will be established and evaluation of the goals and objectives of this project will be conducted by the next progress report.

Project Description

The Bayou Sauvage Hydrologic Restoration (PO-16) project is located in the 23,820-acre Bayou Sauvage National Wildlife Refuge (NWR), 16 mi east of New Orleans in Orleans Parish (figure 3). The 3,800-acre project area is bounded by U.S. Highway 90 to the north, the Lake Pontchartrain Hurricane Protection Levee to the east and south, and the Maxent Canal levee to the west. The Lake Pontchartrain Hurricane Protection Levee, built in 1956, hydrologically isolates the project area from the surrounding estuary, creating a large impoundment with water depths ranging from 1 to 2 ft

(USFWS 1994). The construction of these levees reduced tidal flow, leaving precipitation as the major source of water for the area. The PO-16 project area is divided into two units (North Unit and South Unit) that are separated by a railroad embankment (figure 1). The reference area is part of the Bayou Sauvage NWR and is located north of the project area adjacent to Lake Pontchartrain within the Hurricane Protection Levee system (figure 3).

Following the construction of the Hurricane Protection Levee, the Maxent Canal Levee was breached, and the South Unit was drained for an extensive time, causing sediment oxidation, subsidence, and compaction that lead to accelerated marsh loss. The North Unit was not exposed to this drainage, therefore, it experienced more gradual marsh loss (USFWS 1991). Approximately 117 ac/yr of marsh habitat were lost from 1956 to 1978 throughout the entire refuge (USFWS 1994). Within the project area units, land loss was 81 ac/yr (69% of the total land loss), primarily as a result of the processes described above (USFWS 1994).

The project area is classified as impounded fresh marsh (USFWS 1991). The dominant species in the area include *Spartina patens* (Ait.) Muhl. (marshhay cordgrass), *Alternanthera philoxeroides* (Mart.) Griseb. (alligatorweed), *Ludwigia leptocarpa* (Nutt.) Hara (anglestem water primrose), and *Panicum spp.* (USFWS 1991). The reference area is classified as fresh/intermediate marsh (USFWS 1991), dominated by *S. patens* and *Ipomoea sagittata* Poir. In Lam. (saltmarsh morningglory*)*.

The main objective of this project is to enhance emergent fresh marsh habitats in the project area. The project-specific goals are to (1) promote the reestablishment of emergent marsh vegetation; (2) lower water levels to marsh elevation or to half a foot below marsh elevation (ME) (-0.5 ft ME) during the spring and summer, and to within +0.5 ft of ME during the fall and winter; and (3) maintain *Salix nigra* Marsh. (black willow) habitat in order to maintain wading bird rookeries.

To achieve the project objective, a 48-in. pump was installed in each unit (figure 1) to lower water levels during the spring and summer. A weir was installed south of the railroad across a small trenasse on the south bank of Bayou Thomas to ensure that the units are hydrologically isolated once water levels in the north unit fall to the level of the weir. All pump operations are conducted and recorded by USFWS personnel (table 2).

Monitoring Design

Near-vertical, color-infrared aerial photography (1:12,000 scale) will be obtained in preconstruction and three times postconstruction in years 2001, 2007, and 2013 (± 3 yrs) to document changes in marsh loss rates over time.

Water levels will be recorded weekly at five staff gauges within the project area (three in the North Unit and two in the South Unit) (figure 1) and three locations within the reference area (figure 2 and table 1). Hydrologic data (temperature, salinity, specific conductance, and water depth) will be recorded hourly during the first postconstruction year (1996-97) at station PO16–01 in the North Unit (figure 1) and at station PO16–12R in the reference area (figure 2) with a continuous recorder. The recorders will be maintained for 1–2 years post construction.

Vegetation will be monitored annually in the project and reference areas to determine species composition, percent cover, and relative abundance. Sampling is conducted using the modified Braun-Blanquet method (Steyer et al. 1995). The vegetation transects sampled were established from sites sampled by USFWS (Harris 1989) using the line-intercept method (Chabreck 1972; Fletcher 1983). Four transects in the project area (figure 1) and four transects in the reference area (figure 2) were chosen to intersect dominant habitat types found in the project and reference areas. These included fresh marsh, *S. patens* marshes, *S. nigra* stands, and open water. In order to incorporate the modified Braun-Blanquet method (Steyer et al. 1995), each transect was divided equally into 10 plots, 5 of which were randomly selected for sampling. This provided a total of 20 permanent plots in the project area and 20 permanent plots in the reference area. The plot size sampled was 2–m^2. The primary method for evaluating changes in vegetation will be an analysis of variance (ANOVA) that will consider spatial and temporal variations, with interaction of water levels.

Results/Discussion

Color-infrared aerial photography for the preconstruction phase of the project was flown in November 1993. Additionally, the NWR conducted a flight in December 1996 that will be used as the first postconstruction flight. The photography has been georectified and ground truthed by the National Wetland Research Center (NWRC). Wetland gain/loss rates within the project area are being determined by the NWRC.

There was a reduction in water levels in both the North and South Units of the project area following the startup of the pumps on April 15, 1996; however, the water level in the reference area also dropped at this time (figure 4). Pumps were shutdown on May 3, 1996, as specified in the Annual Water Management Plan for the refuge (Harris 1995). Water levels continued to decline after the shutdown of the pumps in both the project and reference areas. The observed springtime drop in water levels probably reflects the lower than normal spring rainfall in Louisiana in 1996 (Louisiana Office of State Climatology [LOSC] 1996) rather than the pump operations for the project. The pump in the North Unit was restarted June 22, 1996, due to increasing water levels, and an overall reduction in water level was noted. The pump in the South Unit could not be operated again because of mechanical problems. During the time period following June 22, 1996, the South Unit (broken pump) and the reference area (no pump) showed an overall increase in water levels. The pump in the North Unit was turned off July 12, 1996.

Continuous recorders continued to collect water level data after July 13, 1996; however, staff gauge readings were not available from USFS personnel to convert the data to NAVD. These data were not presented and will be included in the next progress report.

The effects of the project on water level cannot be adequately evaluated because of the difficulties encountered in establishing permanent staff gauges. The temporary continuous recorders and permanent staff gauges have not been surveyed to marsh elevation, making the evaluations of the project goal to reduce water levels in relation to marsh elevation impossible at this time. Before the writing of the next progress report, marsh elevation should be established and the hydroperiod of the

project area will be determined for the continuous recorder period of record, enabling evaluations of water level changes in relation to marsh sediment elevation.

Raw data from the vegetation transects monitored during September 1996 are presented in table 3. Several of the plots on the transects fell in open water and therefore had no emergent vegetation. Transects 7, 8, 9, and 9a are located in the project area (figure 1). The dominant species noted in transect 7 (North Unit) were *S. patens* and *Bacopa monnieri* (L.) Pennell (coast hyssop). The dominant species on transect 8 (North Unit) were *Panicum dichotomiflorum* Michx. (fall panic grass) and *B. monnieri*. Transect 9 (South Unit) ran across open water and contained no emergent vegetation. Transect 9a (South Unit) exhibited lush, tall stands of *L. leptocarpa,* which was the most abundant species on this transect. The South Unit contains a greater percentage of open water than the North Unit.

Transects 18, 19, 20, and 21 are located in the reference area (figure 2). Transects 18 and 19, which were both burned recently, showed a dominance of *S. patens* and *I. sagittata*. Transects 20 and 21 ran across open water and contained no emergent vegetation.

Comparison of the 1989 vegetation data collected by USFWS to the 1996 data set is difficult because it was not possible to relocate the exact sampling stations used in 1989. A cursory comparison of the 1989 and 1996 data sets indicate differences in dominant species only on transect 7. Most of that area was dominated by *Sacciolepis striata* (L.) Nash (American cupscale*)* in 1989 with limited occurrences of *S. patens*. In 1996, however, *S. patens* dominated all three of the stations on transect 7 containing emergent vegetation (table 3). It is not known if the difference between the data sets resulted from difference in the locations of the sample plots (i.e., spatial variability in the plant community), or from differences over time in the plant community (i.e., temporal variability).

Effects of the project on vegetation cannot be evaluated at this time because of limited data. It is critical that comparison of vegetation data be made using permanent plots to minimize spatial variability that can mask temporal variability (Morris and Haskin 1990). Therefore, future project vegetation comparisons will rely on the permanent plots established in 1996.

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USFWS. See U.S. Fish and Wildlife Service.

Prepared on May 5, 1997, by Shannon Holbrook.

LDNR Monitoring Manager:	Shannon Holbrook NR Geoscience Supervisor	(504) 342-6750
LDNR DAS Assistant:	Kirk Rhinehart NR Geoscience Specialist III	(504) 342-2179
LDNR Project Manager:	George Boddie	(504) 342-6878
Federal Sponsor:	USFWS/Pondexter Dixson	(504) 646-7545
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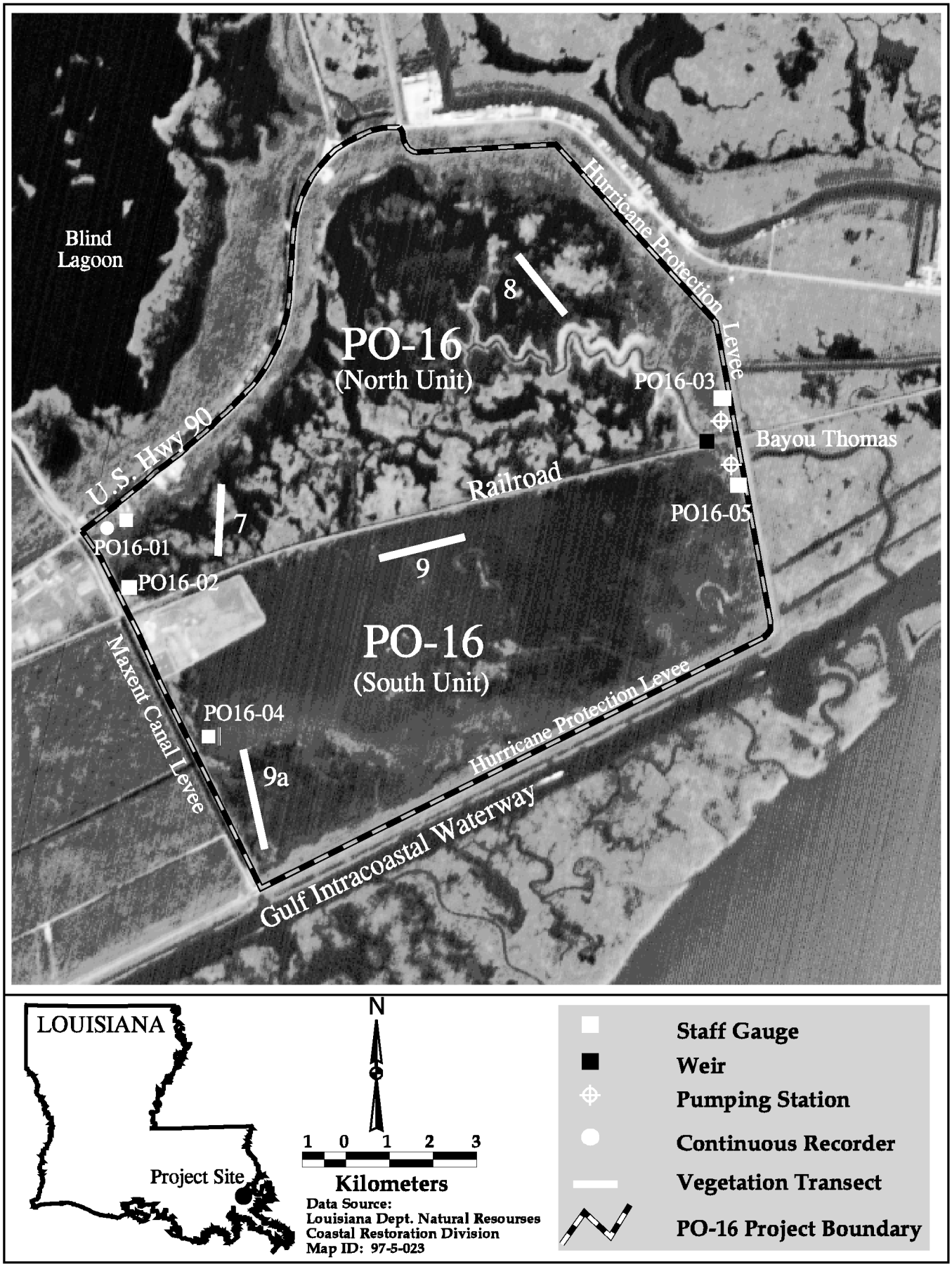

Figure 1. Project boundary and features for Bayou Sauvage Hydrologic Restoration (PO-16) project.

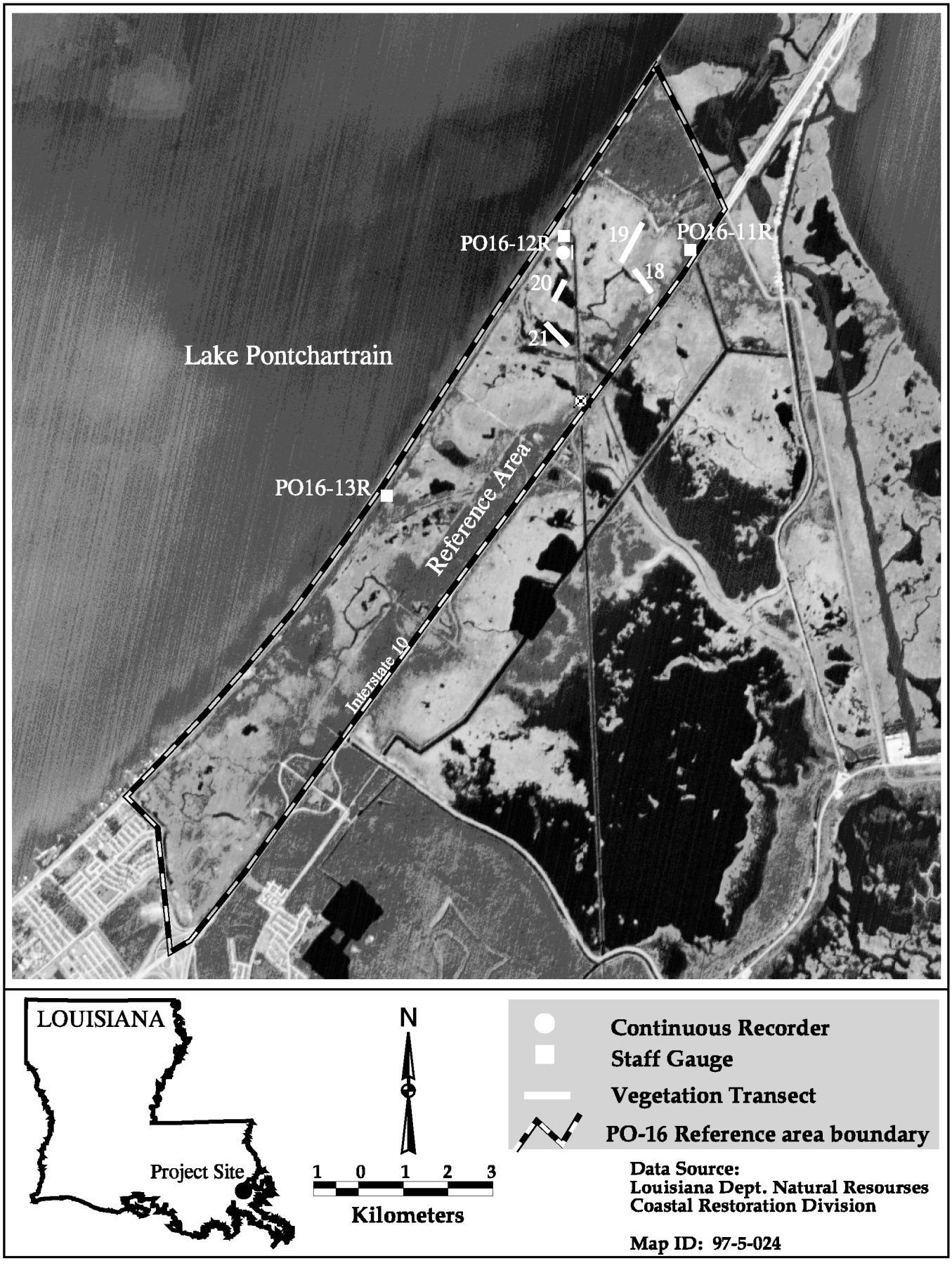

Figure 2. Reference area boundary and features for Bayou Sauvage Hydrologic Restoration (PO-16) project.

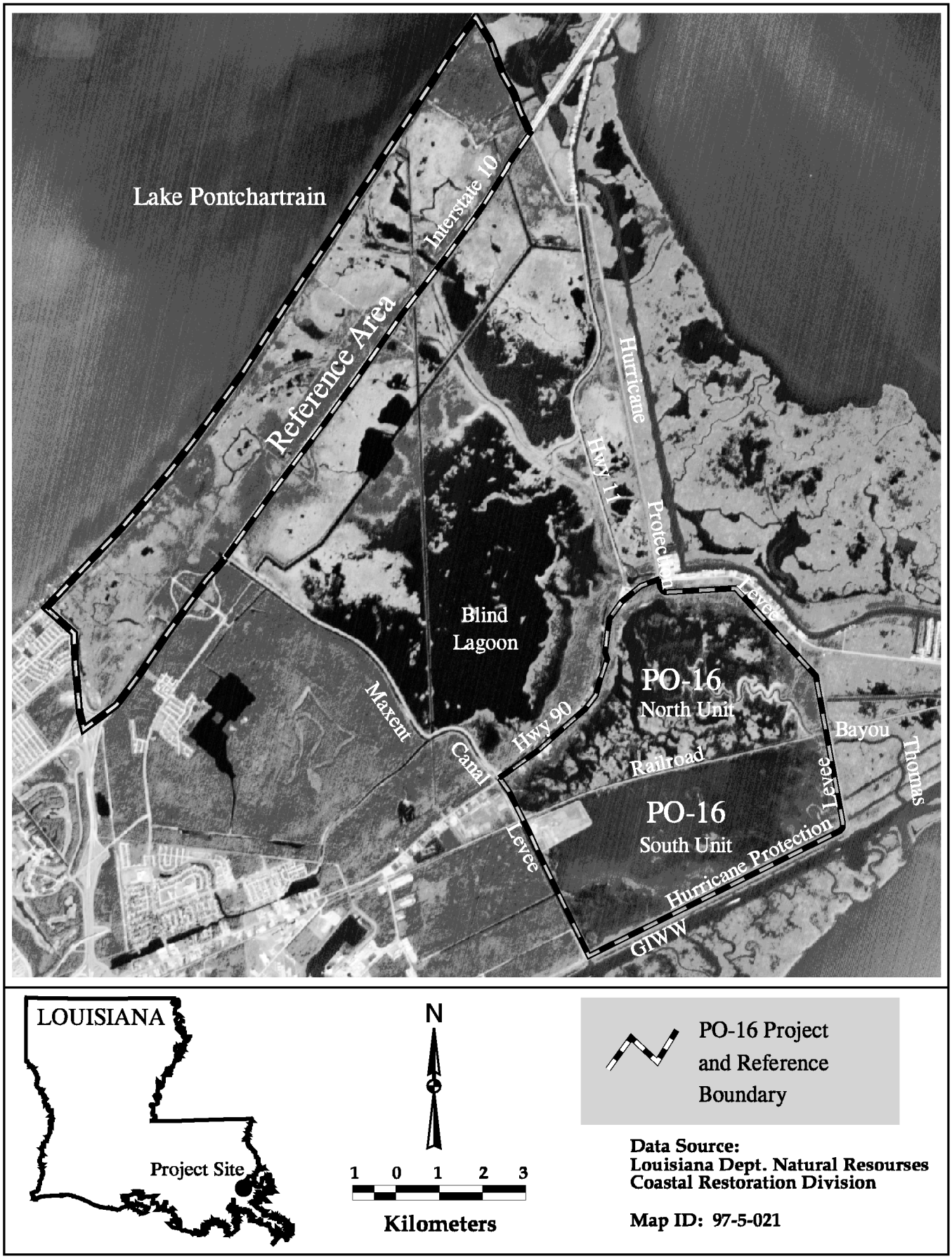

Figure 3. Project and reference area boundaries for the Bayou Sauvage Hydrologic Restoration (PO-16) project

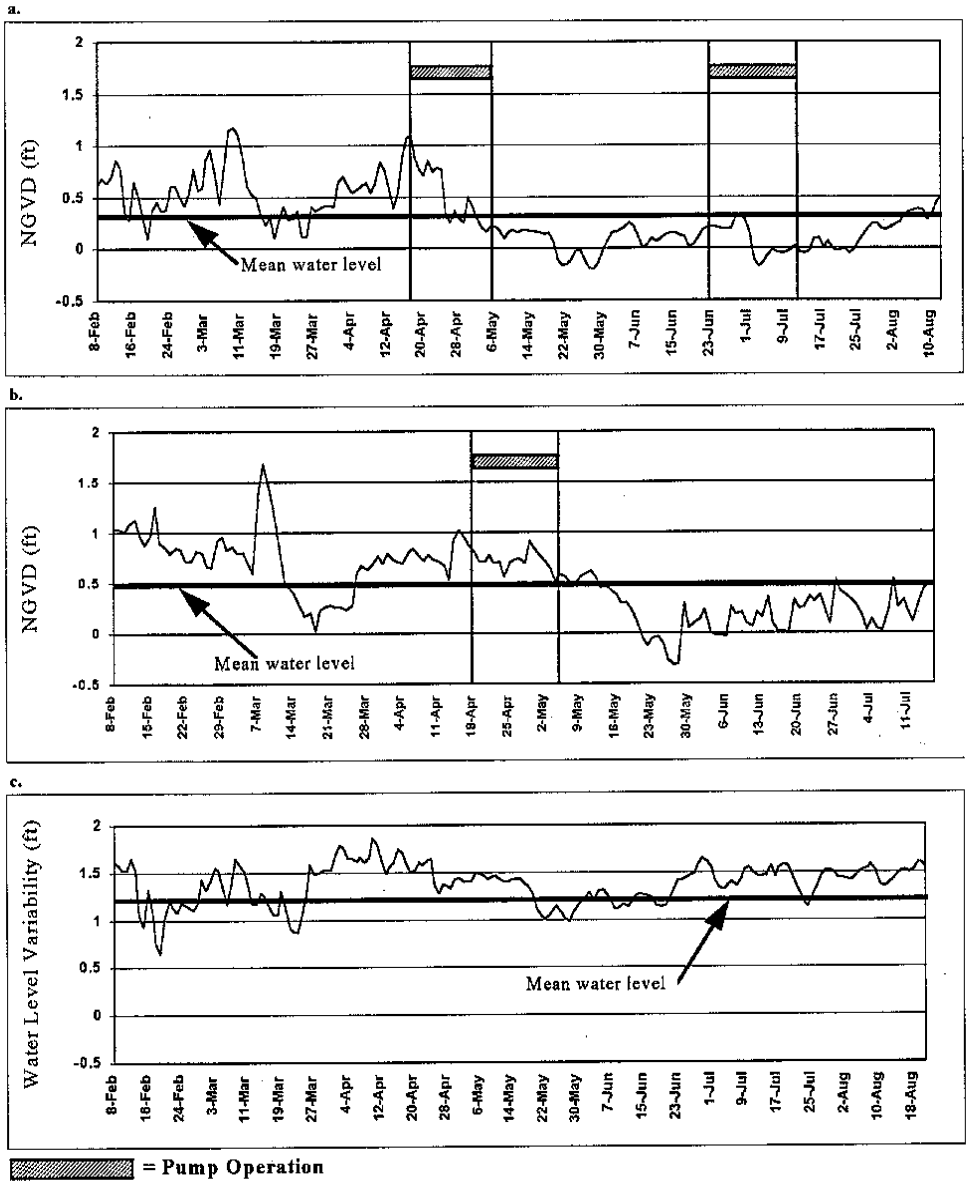

Figure 4: Water levels relative to NGVD for (a.) the north unit of the Bayou Savauge Phase I PO-16 project from daily means of continuous recorder data collected February 1996 to August 1996, and (b.) the south unit of the project from daily means of continuous recorder data collected February 1996 to July 1996. Water level variability (c.) for the reference area using daily means of continuous recorder data collected from February 1996 to August 1996.

Table 1. Staff gauge readings for project and reference areas at Bayou Sauvage (PO-16).

	PROJECT AREA					REFERENCE AREA		
DATE	NORTH UNIT			SOUTH UNIT				
	PO1601	PO1602	PO1603	PO1604	PO1605	PO1611	PO1612	PO16
3/5/96	0.7			0.6				
3/22/96	0.3			0.2				
3/25/96	0.1			0.1				
3/28/96	0.75			0.5				
4/1/96	0.85			0.7				
4/15/96	0.9			0.95				
4/16/96	1.1							
5/8/96	0.1			0.5				
6/14/96	0.1			0.3				
7/17/96	0.0			-0.2				
8/12/96	0.5			0.6				
11/6/96	0.6			0.5				
11/15/96	0.5			0.4				
11/19/96	0.4			0.2				
11/25/96	0.3			0.2				
12/2/96	0.3			0.4				
12/10/96	0.3			0.4				
12/16/96	0.3			0.3				
12/23/96	0.4			0.3				
12/30/96	0.5			0.5				
1/6/97	0.7			0.7				
1/13/97	0.7			0.75				
1/29/97	0.9			0.9				
2/13/97	0.9			0.9				
2/20/97	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
2/26/97	0.7	0.75	0.75	0.8	0.8	0.9	1.0	1.0
3/6/97	0.8	0.8	0.75	0.8	0.7	0.8	0.85	0.8
3/12/97	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7
3/20/97	0.5	0.6	0.7	0.6	0.65	0.8	0.8	0.8
3/24/97	0.65	0.7	0.7	0.65	0.6	0.9	0.9	0.9
3/31/97	0.8	0.8	0.9	0.85	0.7	0.9	0.9	0.9

Table 2. USFWS operations of the Bayou Sauvage Hydrologic Restoration (PO-16) pumps in the north and south units.

	Operation	
Date	Pump 5 (North)	Pump 6 (South)
April 14-18, 1996	Startup	Startup
April 19, 1996	Shutdown at 4:00 p.m.	Shutdown at 4:00 p.m.
April 22, 1996	Startup	Startup
April 26, 1996	Shutdown at 4:00 p.m.	Shutdown at 4:00 p.m.
April 29, 1996	Startup	Startup
May 3, 1996	Shutdown at 4:00 p.m.	Shutdown at 4:00 p.m.
June 22, 1996	Startup	Pump not working
June 28, 1996	Shutdown at 4:00 p.m.	Pump not working
July 9, 1996	Startup	Began repairs
July 12, 1996	Shutdown at 4:00 p.m.	
March 21, 1997		Startup
March 24, 1997		Shutdown

Table 3. Percent cover by species for vegetation transects in the project area (nos. 7, 8, 9, 9a) and reference area (nos. 18,19, 20, 21) surveyed on September 1996 at Bayou Sauvage Hydrologic Restoration (PO-16) project. Results are presented for each of the five plots sampled within each transect. Plant names follow Godfrey and Wooten (1979 and 1981.)

Species	**Transect # 7**					**Transect #8**					**Transect #9**				
	1	2	3	4[a]	5[a]	1	2	3	4	5	1[a]	2[a]	3[a]	4[a]	5[a]
Spartina patens	90		90												
Spartina patens (dead)															
Panicum dichotomiflorum						95	90	80-85	25	15					
Bacopa monnieri	45	90	<1					<1	25	95					
Ludwigia leptocarpa			5												
Ipomoea sagittata	10		<5												
Sesbania drummondii			65					25	<1						
Cyperus odoratus	<1	25	5				<1	10	<1	<					
Salix nigra (dead)															
Phyla nodiflora	35														
Hibiscus moscheutos	<1														
Vigna luteola						15-20									
Ammannia latifolia		20													
Sesbania macrocarpa															
Alternanthera philoxeroides	10						<1	<1	<1						
Paspalum distichum										10					
Juncus roemerianus															
Salix nigra															
Pluchea camphorata		5													
Echinochloa walteri		5													
Spartina alterniflora															
Solidago sempervirens									1						
Hydrocotyle umbellata															

[a] stations in open water

Table 3. (continued)

Species	Transect # 9a					Transect #18					Transect #19				
	1	2	3[a]	4[a]	5	1	2	3	4	5	1	2	3	4	5
Spartina patens						60	40	35	20	45	45	50	55	40	60
Spartina patens (dead)						40	45	15	55	15	35	45	25	35	15
Panicum dichotomiflorum															
Bacopa monnieri															
Ludwigia leptocarpa	55	90			1										
Ipomoea sagittata						1	1	15	10	20	10	15	15	10	5
Sesbania drummondii										1					5
Cyperus odoratus	10	1										<1			
Salix nigra (dead)								20		15					
Phyla nodiflora															
Hibiscus moscheutos											5	<1	5	10	10
Vigna luteola							1	1		5					
Ammannia latifolia															
Sesbania macrocarpa		15													
Alternanthera philoxeroides															
Paspalum distichum															
Juncus roemerianus														10	
Salix nigra							5			1					
Pluchea camphorata															
Echinochloa walteri															
Spartina alterniflora															5
Solidago sempervirens															
Hydrocotyle umbellata		1													

Table 3. (continued)

Species	**Transect # 20**					**Transect #21**				
	1[a]	2[a]	3[a]	4[a]	5[a]	1[a]	2	3[a]	4[a]	5[a]
Spartina patens										
Spartina patens (dead)										
Panicum dichotomiflorum										
Bacopa monnieri										
Ludwigia leptocarpa										
Ipomoea sagittata										
Sesbania drummondii										
Cyperus odoratus										
Salix nigra (dead)										
Phyla nodiflora										
Hibiscus moscheutos										
Vigna luteola										
Ammannia latifolia										
Sesbania macrocarpa										
Alternanthera philoxeroides										
Paspalum distichum										
Juncus roemerianus										
Salix nigra										
Pluchea camphorata										
Echinochloa walteri										
Spartina alterniflora										
Solidago sempervirens										
Hydrocotyle umbellata										