BAYOU SAUVAGE HYDROLOGIC RESTORATION (PO-16)
PO-16-MSPR-1296-1

PROGRESS REPORT No. 1
for the period
May 1, 1996, to November 4, 1996

Project Description/Status

The Bayou Sauvage Hydrologic Restoration (PO-16) project is located in the 23,820-acre Bayou Sauvage National Wildlife Refuge, 16 mi east of New Orleans in Orleans Parish (figure 1). The 3,800-acre project area is bounded by U.S. Highway 90 to the north, Pontchartrain Hurricane Levee to the east and south, the Gulf Intracoastal Waterway to the south, and the Maxent Canal levee to the west. The Lake Pontchartrain Hurricane Protection Levee, built in 1956, isolates the project area from the surrounding brackish marsh complex, creating a large impoundment with water depths ranging from 1 to 2 ft (U.S. Fish and Wildlife Service [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 and south) that are separated by a railroad embankment (figure 2). The reference area is part of the Bayou Sauvage NWR and is located north of the project area adjacent to Lake Pontchartrain (figure 1).

Following the construction of the Hurricane Protection Levee, the south unit was drained for an extensive time, causing oxidation, subsidence, and compaction that lead to an accelerated marsh loss. The north unit was not exposed to this dewatering; therefore, it experienced a more gradual marsh loss and subsidence (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, primarily 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 marshhay cordgrass (*Spartina patens)*, alligatorweed (*Alternanthera philoxeroides), Ludwigia spp*., and *Panicum spp.* (USFWS 1991). The reference area contains fresh/intermediate marsh, dominated by marshhay cordgrass and marsh morning glory (*Ipomoea sagittata)*.

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 in the project area to marsh eleation or to half a foot below marsh elevation during the spring and summer, and to within +0.5 ft of marsh elevation during the fall and winter; and (3) maintain black willow (*Salix nigra*) habitat in order to promote wading bird rookeries.

To achieve the project objective, a 48-in. pump was installed in each unit (figure 2) to draw water levels down during the spring and summer. A plug was installed on Bayou Thomas south of the railroad to ensure that the units are separated. The pumps are used to maintain water levels within 0.5 ft of marsh elevation during the fall and winter. All pump operations are conducted and recorded by USFWS personnel (table 1).

Monitoring Design

Near-vertical, color-infrared aerial photography (1:18,000 scale) was obtained in November 1993 and will be used to document changes in marsh loss rates over time. Additional photography (1:12,000 scale) will be obtained in years 2001, 2007, and 2013 ± 3 yrs.

Water levels will be measured weekly at five staff gauges within the project area (three in the north unit and two in the south unit) (figure 2) and three locations within the reference area (figure 3). To date, 1 staff gauge within each unit was monitored weekly for 2 mo and monthly for 4 mos by USFWS personnel (figure 2). Hydrologic data (temperature, salinity, specific conductance, and water depth) was recorded hourly during the first postconstruction year at one station in the north unit (figure 2) and at one station in the reference area (figure 3) with a continuous recorder. The recorders will be maintained until the permanent staff gauges are in place.

Vegetation is monitored annually using the modified Braun-Blanquet method (Steyer et al. 1995) in the project and reference areas to determine species composition, percent cover, and relative abundance. The vegetation transects sampled are existing transects established by USFWS (Harris 1989), which were sampled using the line-intercept method (Harris 1989). Four transects in the project area (figure 2) and four transects in the reference area (figure 3) were chosen to intersect all habitat types found in the project and reference areas, including fresh water, marshhay cordgrass, black willow, and open water. In order to incorporate the Braun-Blanquet method (Steyer et al. 1995), each existing transect was divided into 10 plots of equal distance apart, 5 of which were randomly selected to be sampled for 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 x 2 m.

As data is collected, the primary method for evaluating changes will be by an analysis of variance (ANOVA) that will consider spatial and temporal variation and interaction for water levels and vegetation. Statistical evaluation of data collected to date would be premature.

Results/Discussion

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 drought of 1996 (Louisiana Office of State Climatology [LOSC] 1996) rather than the pump operations for the project. The pump in the north unit was again started June 22, 1996, and an overall reduction in water level was noted. The pump in the south unit could not be turned on again due to mechanical problems. During the time period following June 22, the south unit (broken pump) and the reference area (no pump) showed an overall increase in water level.

The effects of the project on water level cannot be evaluated because of the difficulties encountered in establishing the permanent staff gauges. This difficulty was recognized and prompted the installation of the continuous data recorders. 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, the permanent staff gauges should be installed, marsh elevation established, and the hydroperiod of the project area will be determined for the dates for which the recorder was in place, enabling evaluations of water level change.

Raw data from the vegetation transects monitored September 1996 are presented in table 2. Several of the plots on the transects fell in open water and therefore had no emergent vegetation present at the initial monitoring. Transects 7, 8, 9, and 9a are located in the project area (figure 2). The dominant species noted in transect 7 (north unit) were marshhay cordgrass and coastal water-hyssop (*Bacopa monnieri)*. The dominant species on transect 8 (north unit) were fall panic grass (*Panicum dichotomiflorum)* and coastal water-hyssop. Transect 9 (south unit) ran across open water and no emergents were observed. Transect 9a (south unit) exhibited lush, tall stands of primrose-willow (*Ludwigia leptocarpa),* which was the most abundant species on this transect. The south unit contains more open water than the north unit.

Transects 18, 19, 20, and 21 are located in the reference area (figure 3). Transects 18 and 19, which were both recently burned, showed a dominance of marshhay cordgrass and marsh morning-glory. Transects 20 and 21 ran across open water and no emergent species were noted.

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 bagscale (*Sacciolepis striata)* in 1989 with limited occurrences of marshhay cordgrass. In 1996 however, marshhay cordgrass dominated all 3 of the stations on transect 7 containing emergent vegetation (table 2). 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). Likewise, differences in the percent of stations sampled in open water between 1989 and 1996 might have influenced this result.

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 because spatial variability in marsh vegetation can mask temporal variability (Morris and Haskin 1990). Therefore, future project evaluations will rely more heavily on the permanent plots established in 1996.

References

Harris, J. 1989. Floristic Survey of the (Proposed) Bayou Sauvage National Wildlife Refuge. Slidell, La.: USFWS, Refuge Division. 50 pp.

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Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swenson 1995. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

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

Prepared on December 19, 1996, by Shannon Holbrook.

LDNR Monitoring Manager:	Shannon Holbrook NR Geoscience Specialist II	(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
Construction Start:	August 1, 1995	
Construction End:	May 1, 1996	

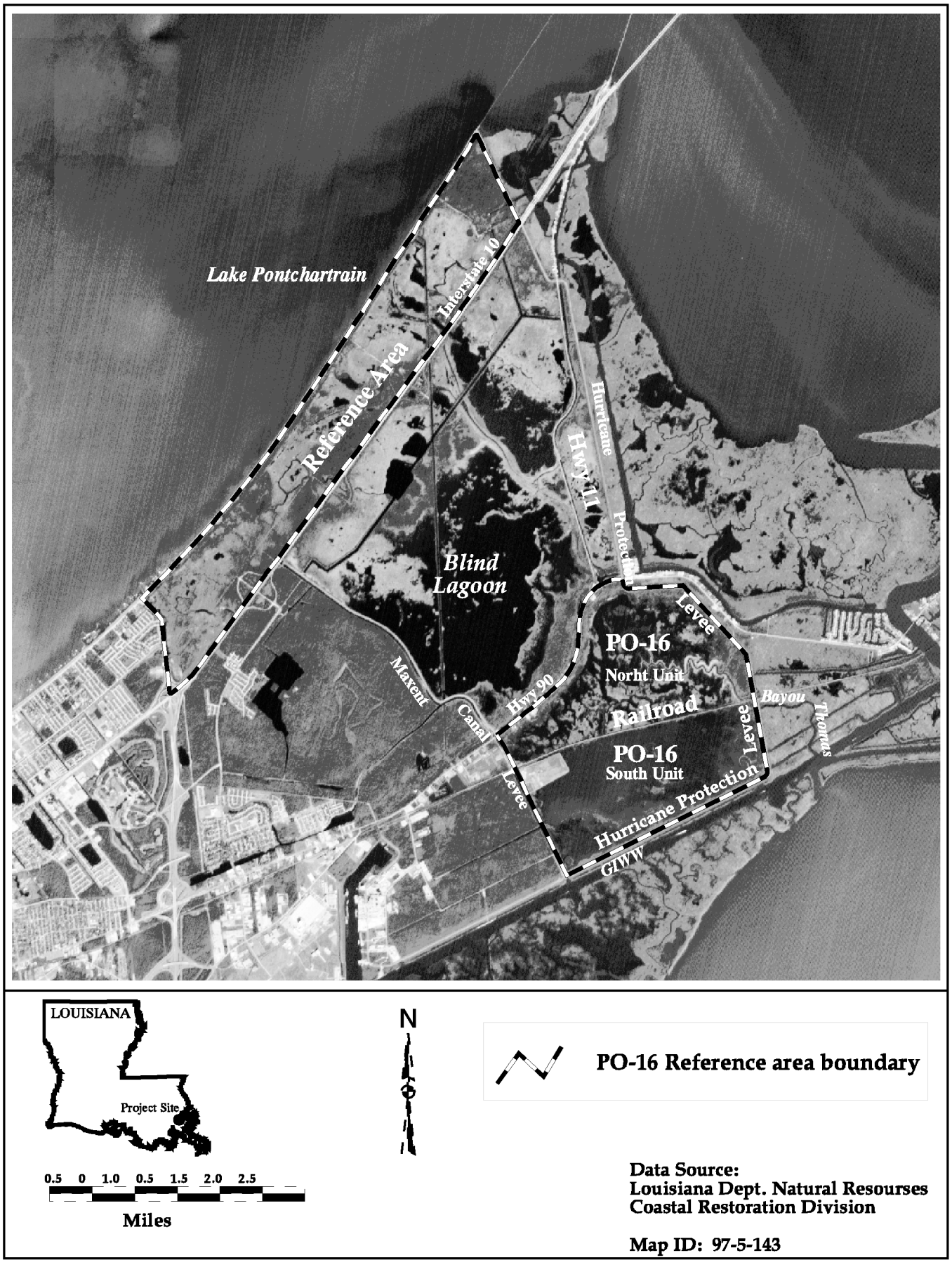

Figure 1 Project and reference area boundary for the Bayou Sauvage Hydrologic Restoration (PO-16) project.

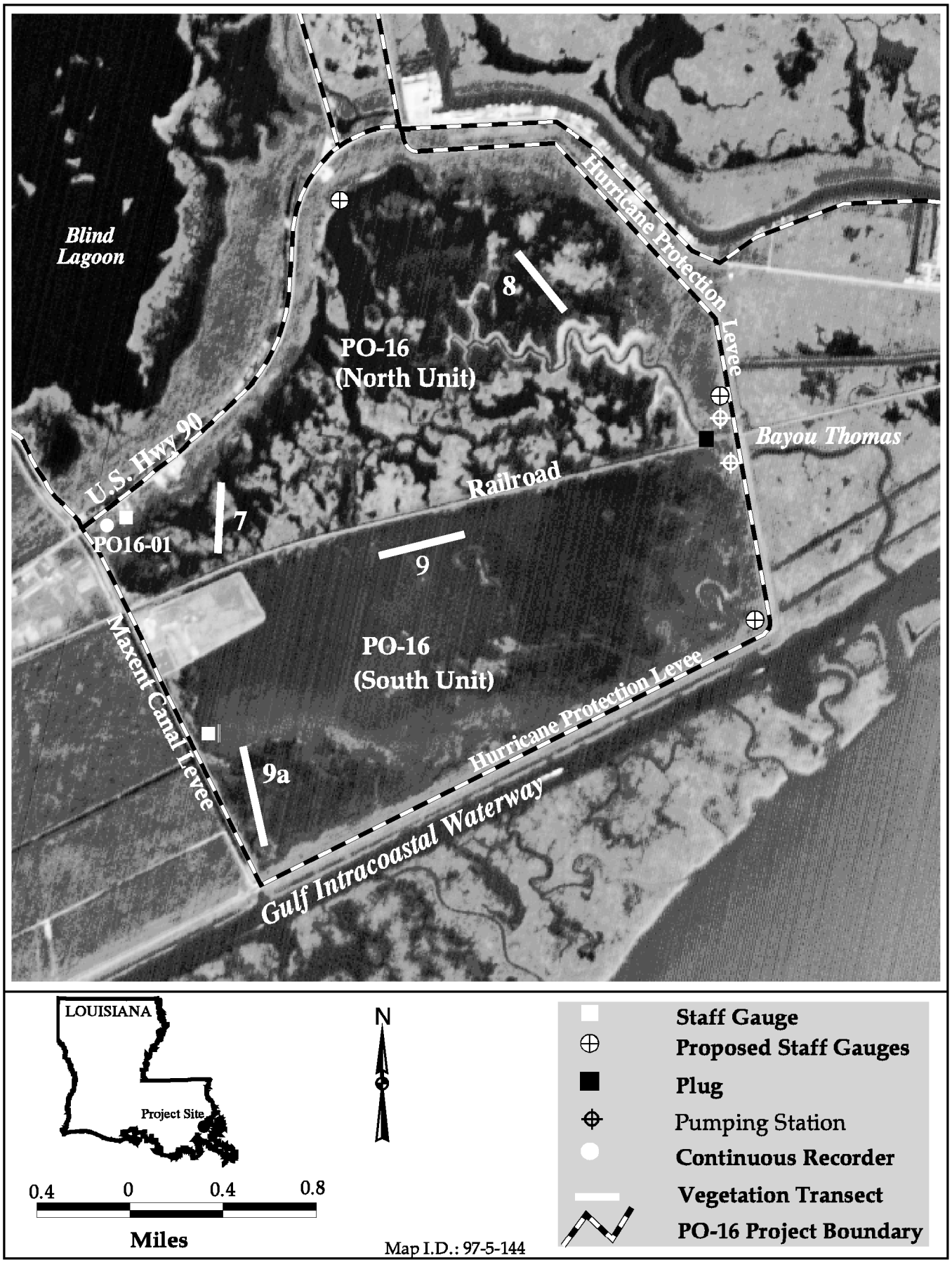

Figure 2. Project boundary and features for Bayou Sauvage Hydrologic Restoration (PO-16) project.

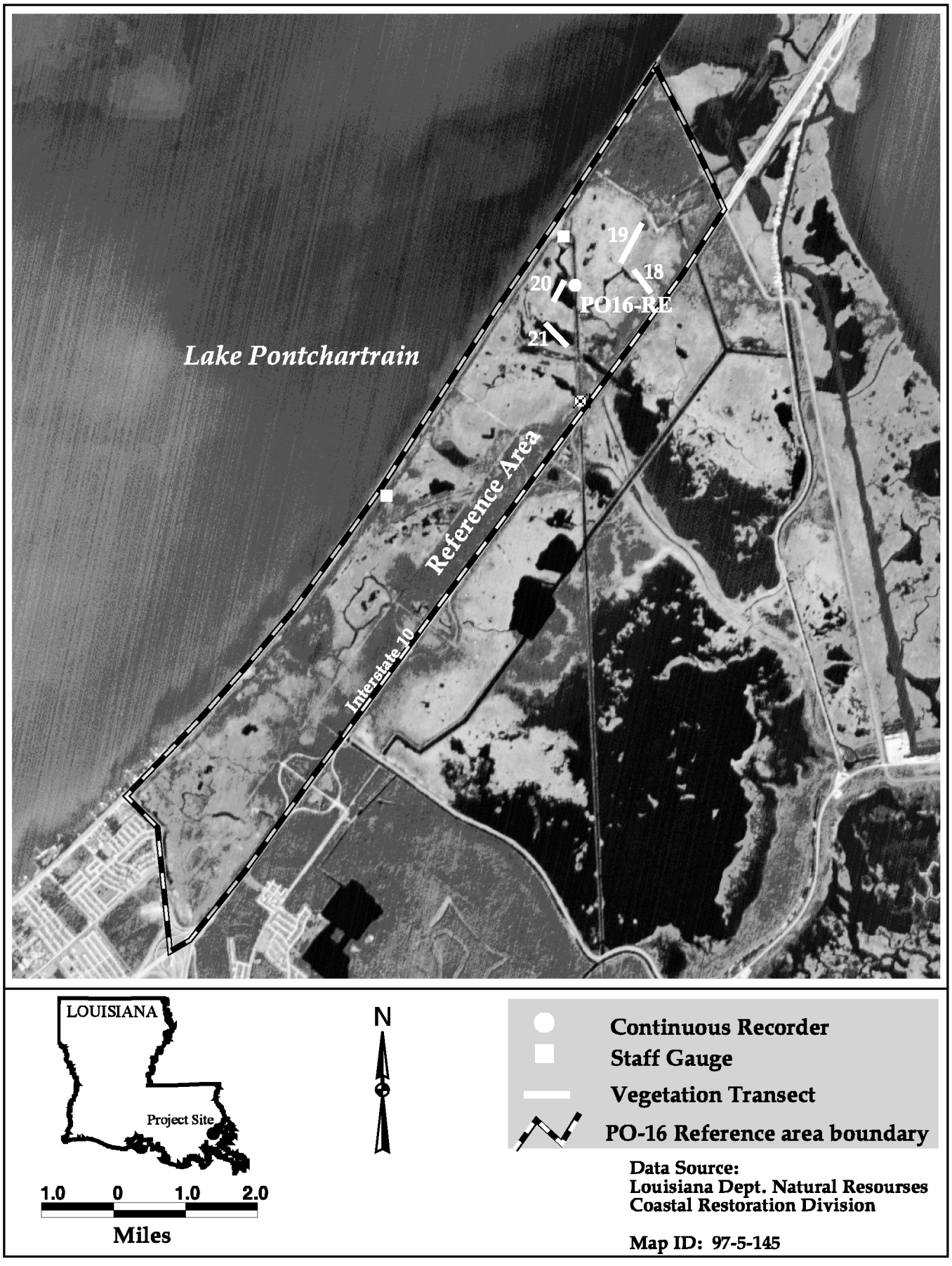

Figure 3. Reference area boundary and features for Bayou Sauvage Hydrologic Restoration (PO-16) project.

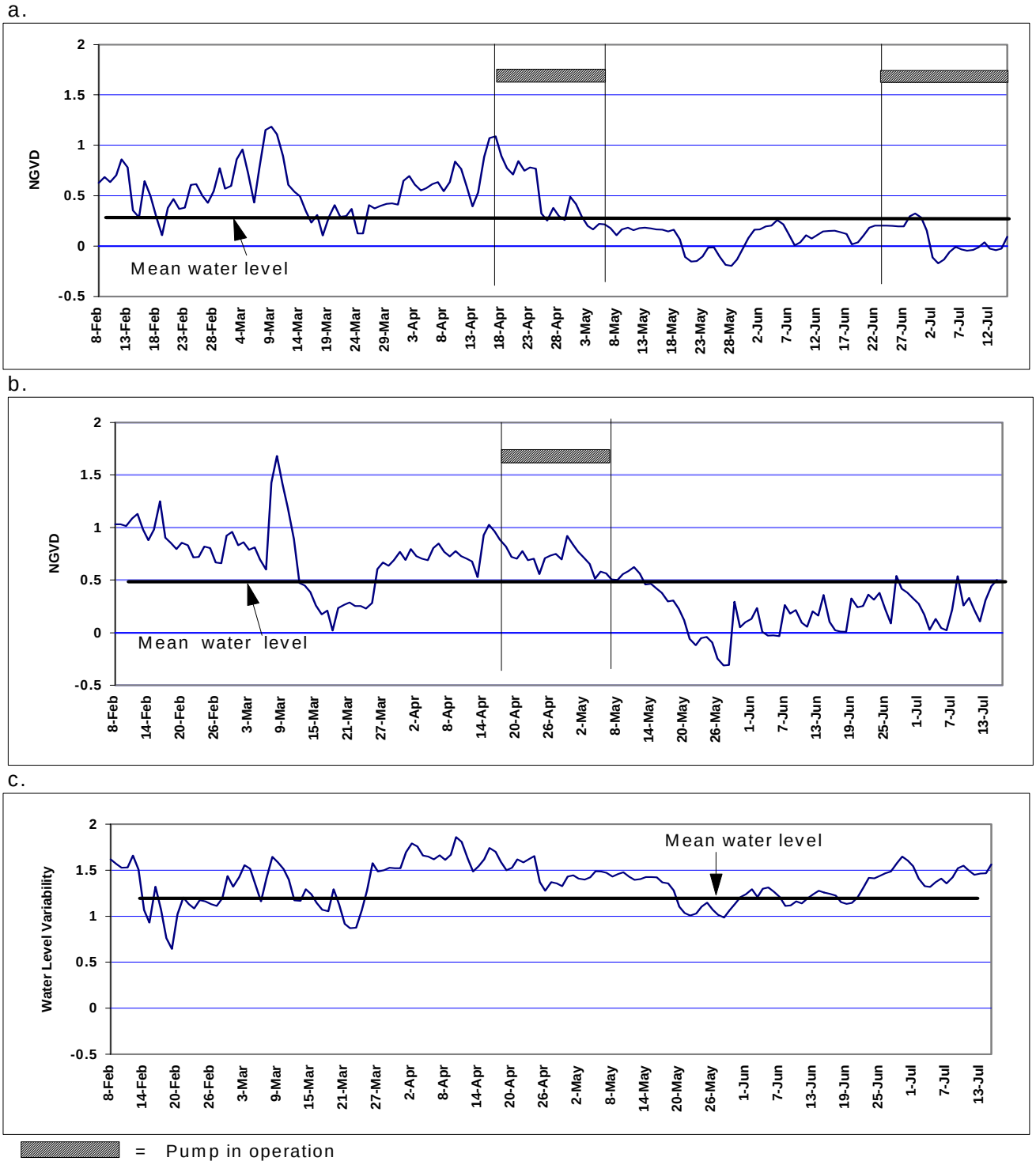

Figure 4. Water levels relative to NGVD for [a.] the north unit and [b.] the south unit of the Bayou Sauvage Phase I (PO-16) project from daily means of data collected February 1996 to August 1996. [c.] Water level variability for the reference area using daily means of continuous recorder data collected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

Table 1. 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.	
July 15, 1996	Startup	

Table 2. Percent cover by species for the project area (nos. 7, 8, 9, 9a) and reference area (nos. 18,19, 20, 21) vegetation transects surveyed September 1996 at Bayou Sauvage Hydrologic Restoration (PO-16) project. Results are presented for each of the five plots sampled within each transect. Stations in open water are denoted by an asterisk (*).

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

Table 2. (continued

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

Table 2. (continued)

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