State of Louisiana
Department of Natural Resources
Coastal Restoration Division and
Coastal Engineering Division

2004 Operations, Maintenance, and Monitoring Report

for

LAKE CHAPEAU SEDIMENT INPUT AND HYDROLOGIC RESTORATION, POINT AU FER ISLAND

State Project Number TE-26
Priority Project List 3

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Terrebonne Parish

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2004 Operations, Maintenance, and Monitoring Report
For
Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island

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I. Introduction

The Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project area contains 9,006 ac (3,645 ha) of brackish to intermediate marsh plus 4,543 ac (1,839 ha) of open water. The project is bound to the northwest by Atchafalaya Bay, to the northeast by Four League Bay, and to the south by the Gulf of Mexico. It is located approximately 13 mi (20.9 km) southeast of the mouth of the Atchafalaya River in Terrebonne parish (figure 1).

Marsh loss rates throughout Point Au Fer Island between 1932 and 1974 peaked at 45.45 ac year^{-1} (18.4 ha yr^{-1}) and occurred as a direct result of oil exploration activities. The rate of interior marsh loss has decreased since that time and is currently estimated to be 20.14 ac yr^{-1} (8.15 ha yr^{-1}) (1983-1990). Shoreline erosion along Lake Chapeau was estimated to be 3 ft yr^{-1} (0.91 m yr^{-1}) between 1932 and 1983. The land loss rate inside the TE-26 project boundary was approximately 106.9 ac yr^{-1} (43.3 ha yr^{-1}) between 1988 and 2000. Oil and gas access canals cut into the interior of Point Au Fer Island have deteriorated the hydrologic separation between the Locust Bayou and Alligator Bayou watersheds and dramatically altered the island's natural drainage pattern. Sheet flow and over bank flow were drastically reduced by artificial levees, which in turn impounded marsh and led to degradation due to soil water logging. Due to unnatural hydrologic patterns the abundant sediment load generated by the Atchafalaya River circulating through the island's interior have not been effectively utilized. Additional assumed causes of land loss have been attributed to natural subsidence and natural shoreline erosion.

The objectives of the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project are to convert approximately 260 ac (105 ha) of open water to marsh at a mean elevation of 1.0 ft (0.3 m) National Geodetic Vertical Datum of 1929 (NGVD) west of Lake Chapeau between the Locust Bayou and Alligator Bayou watersheds using sediment mined from Atchafalaya Bay, and to restore natural sediment and hydrologic pathways by plugging canals in the project area.

Construction for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer project began on September 14, 1998 and was completed on May 18, 1999. The project has a 20-year economic life which began in May 1999.

The principal project features include:

- Dredging approximately 78 ac (32 ha) of Atchafalaya Bay waterbottom to approximately -15.0 ft (-4.6 m) NGVD 29 and pumping the 721,931 yd^3 (551,956 m^3) of sediment into a containment area approximately 192 ac (78 ha) in size to an initial target elevation of +1.5 ft (0.46 m) NGVD 29.
- Installation of 46,980 vegetative plugs of *Spartina alterniflora* (L.) (saltmarsh cordgrass) throughout the fill area, placed on 5 ft (1.5 m) center spacings along randomly located paired rows also spaced 5 ft (1.5 m) apart.

- Construction of seven rock weirs across manmade oil access canals located along the fringes of the project area. Six of the weirs were built to a top elevation of 0.0 ft (0.0 m) NGVD 29 with a crest width of 10 ft (3.0 m). One of the weirs included a boat bay constructed to an elevation of -4.0 ft (-1.2 m) NGVD 29 with a fixed crest elevation of 0.0 ft (0.0 m) NGVD 29. All of the weirs were constructed with a core of reef shell wrapped in a geotextile woven fabric layer, and then topped with 2 ft (0.61 m) of 250 lb (113.3 kg) class rock riprap.
- Construction of a 167 ft (60 m) rock plug with a crest height of 5 ft (1.5 m) NGVD 29 along a shoreline breach created by the dredge pipeline. The plug was built from 250 lb (113.3 kg) class rock riprap core placed on top of a geotextile fabric layer.
- Dredging approximately 6,400 linear ft (1951 m) of Locust Bayou to a bottom elevation of -6.0 ft (-1.8 m) NGVD 29 with an average width of 70 ft (21 m). Several 25 ft (7.62 m) gaps were cut into the spoil banks to allow for natural bank overflow and high water events.

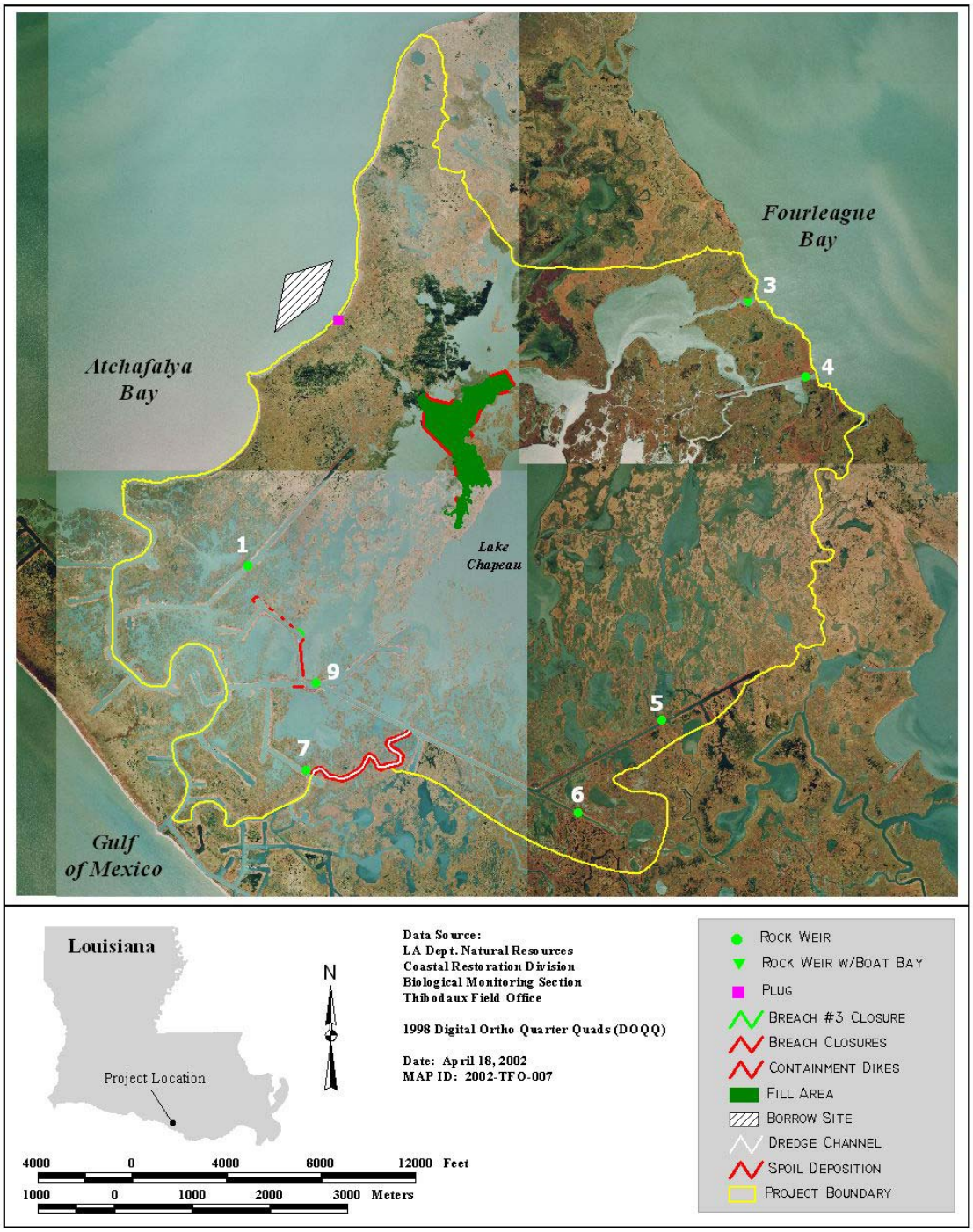

Figure 1. Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project boundary and features.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Lake Chapeau Sediment Input and Hydrologic Restoration Project (TE-26) is to evaluate the constructed project features to identify any deficiencies and prepare a report detailing the condition of project features and recommended corrective actions needed. Should it be determined that corrective actions are needed, LDNR shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, construction, and contingencies and an assessment of the urgency of such repairs.

The field inspection included a complete visual observation of the hydrologic restoration features of the project. Where available, staff gauge readings were used to determine the depth of water over weir sections and elevations of existing rock plugs. The difference between field measurements taken at the time of the inspection and the designed elevation on construction drawings were used to calculate the estimated settlement of each structure. Since no as-built drawings were produced at the completion of construction, the design drawings were relied upon for baseline elevations. A hand-held GPS unit was used to mark observed breaches along canal spoil banks which may require corrective actions or monitoring on future site visits. Photographs and field inspection notes were taken at each project feature to record measurements and deficiencies.

b. Inspection Results

The annual inspection of the Lake Chapeau Sediment Input and Hydrologic Restoration Project (TE-26) took place on two, separate days. The first trip was held on March 9, 2004 to inspect the interior plug sites 1, 5, 6, 7, and 9 and the rock plug along the shoreline of Atchafalaya Bay on the west side of the island. In attendance were Daniel Dearmond, Shane Triche, and Elaine Lear from LDNR, Cheryl Brodnax representing NMFS, and Allan Ensminger, the landowner representative, with Wetlands and Wildlife Management Co. All parties met at Bob's Marina in Bayou Black, Louisiana. The weather conditions included clear skies and mild temperatures with some moderate winds. The annual inspection began at approximately 11:00 a.m. at rock plug site 1, continued through the remaining interior rock plug sites, and ended at 2:15 p.m. on the west side of the project area at the rock plug along the shoreline of Atchafalaya Bay.

The second trip was held on March 30, 2004 to inspect plug sites 3 and 4 located on the east side of the island along the shoreline of Four League Bay. In attendance were Daniel Dearmond, Shane Triche, and Karen Gray from

LDNR and Cheryl Brodnax representing NMFS. All parties met at Bob's Marina in Bayou Black, Louisiana and then traveled to the site by boat where the inspection took place at approximately 10 a.m. The weather conditions included clear skies and mild temperatures.

The results from the annual inspection are as follows:

Rock Plug – Dredge discharge pipeline corridor at the Atchafalaya Bay shoreline

The rock plug located along the Atchafalaya Bay shoreline near the Lake Chapeau corridor was in fair condition with a small breach present on the north side of the rock plug allowing tidal influence into the Lake Chapeau disposal site. The breach measured approximately 15 ft wide and 5 ft in depth. Corrective measures are currently under design to repair the breach and close the pipeline corridor using dredge material from the Atchafalaya Bay in an effort to create additional marsh and protect the existing marsh. LDNR has contracted Acadian Engineers and Environmental Consultants of Eunice, La. to perform topographic and bathymetric surveys of the dredge area, pipeline corridor and breach location.

Site No. 1 – Rock Plug

Overall, the rock plug appeared to be in good condition. The tie-ins at the canal banks had no apparent erosion. The warning signs and supports appeared in good condition. No maintenance will be required at this site.

The water level gage near the site (TE26-03) indicated a water level at time of inspection of -0.33 ft NAVD. The depth of water over the weir was measured at 1.0 foot giving a weir sill elevation of approximately -1.3 ft NAVD. The design weir elevation for Site No. 1 as shown on the construction drawings is 0.0 ft NGVD or -0.14 ft NAVD (after converting using Corpscon). This gives a difference of approximately -1.2 feet between the weir elevation observed in the field and the design elevation. As there was no as-built survey performed on this project, the design elevation was used for comparison.

The damaged warning buoy system is to be replaced by a permanent barricade system.

Site No. 3 – Rock Plug with Boat Bay

The rock plug was found to be in good condition. The north rock tie-in had no signs of erosion; however, the rock tie-in at the south channel bank has experienced some erosion on the front and backside of the rock. It was decided to monitor this tie-in on future visits for increasing erosion. The warning signs and supports were in good condition other than slight fading of

the orange trim and black lettering. No buoy system exists at this structure. No maintenance will be required at this site.

Water level data taken from a sonde (TE26-01R) located in Alligator Bayou north of the site indicated a water level at time of inspection of +0.30 NAVD. The depth of water over the weir was measured at approximately 5.0 feet giving a weir sill elevation of approximately –4.7 ft NAVD. The design weir elevation for Site No. 3 is -4.17 ft NAVD (-4.0 ft NGVD on plans) after converting using Corpscon. The difference between the weir elevation observed in the field and the design elevation is approximately –0.5 feet.

Site No. 4 – Rock Plug

The rock plug appeared to be in good condition. The rock tie-ins, earthen embankments, signs and supports were also in good condition. The damaged warning buoy system is to be replaced by a permanent barricade system. No other maintenance will be required at this site.

Water level data taken from a sonde (TE26-01R) located in Alligator Bayou north of the site indicated a water level at time of inspection of +0.22 NAVD. The depth of water over the weir was measured at approximately 0.5 feet giving a weir sill elevation of approximately –0.3 ft NAVD. The design weir elevation for Site No. 4 is -0.16 ft NAVD (0.0 ft NGVD on plans) after converting using Corpscon. The difference between the weir elevation observed in the field and the design elevation is approximately –0.1 feet.

Site No. 5 – Rock Plug

Rock plug, tie-ins, earthen embankments, warning signs and supports all appeared to be in good condition. The damaged warning buoy system is to be replaced by a permanent barricade system. No other maintenance will be required at this site.

The water level gage near the site (TE26-05) indicated a water level at time of inspection of -0.23 ft NAVD. The weir sill elevation was observed to be approximately equal to the water level. The design weir elevation for Site No. 5 is -0.14 ft NAVD (0.0 ft NGVD on plans) after converting using Corpscon. The difference between the weir elevation observed in the field and the design elevation is approximately -0.1 feet.

Site No. 6 – Rock Plug

Overall, the rock plug was in good condition. The rock tie-ins, earthen embankments, and warning signs and supports were in good condition. The damaged warning buoy system is to be replaced by a permanent barricade system. No other maintenance will be required at this site.

The water level gage near the site (TE26-05) indicated a water level within an hour of the time of inspection of -0.23 ft NAVD. The depth of water over the weir was measured at approximately 0.5 feet except at the center where the depth was approximately 2.0 feet giving a weir sill elevation of approximately -0.7 ft NAVD across most of the weir and approximately -2.2 ft NAVD at the center. Allan Ensminger stated that some of the rock in the center had been removed by crabbers for access. The design weir elevation for Site No. 6 is -0.13 ft NAVD (0.0 ft NGVD on plans) after converting using Corpscon. The difference between the weir elevation observed in the field and the design elevation is approximately -0.6 feet.

Site No. 7 – Rock Plug

The rock plug at this location was in good condition. The rock tie-ins, earthen embankments, and signs and supports were also in good condition. The damaged warning buoy system is to be replaced by a permanent barricade system. No other maintenance will be required at this site.

The water level gage near the site (TE26-05) indicated a water level within an hour of the time of inspection of -0.23 ft NAVD. The depth of water over the weir was measured at approximately 1.9 feet giving a weir sill elevation of approximately -2.1 ft NAVD. The design weir elevation for Site No. 7 is -0.13 ft NAVD (0.0 ft NGVD on plans) after converting using Corpscon. The difference between the weir elevation observed in the field and the design elevation is approximately -2.0 feet.

Site No. 9 – Rock Plug

The rock plug at this location was in good condition. The rock tie-ins, earthen embankments, and signs and supports were also in good condition. The damaged warning buoy system is to be replaced by a permanent barricade system. No other maintenance will be required at this site.

The water level gage near the site (TE26-05) indicated a water level at time of inspection of -0.23 ft NAVD. The depth of water over the weir was measured at approximately 1.6 feet giving a weir sill elevation of approximately -1.8 ft NAVD. The design weir elevation for Site No. 9 is -0.14 ft NAVD (0.0 ft NGVD on plans) after converting using Corpscon. The difference between the weir elevation observed in the field and the design elevation is approximately -1.7 feet.

Overall, the rock plugs (No. 4,5,6,7 & 9) located within the project area were in good condition with no recommended repairs as a result of the 2004 Annual Inspection. However, the warning buoy system designed to notify boaters of underwater obstructions and prevent passage over the structures were severely

damaged. Picciola and Associates of Larose, La. have been contracted by LDNR to design a more rigid barrier system to replace the existing floating system. Construction should be completed in late 2004.

Locust Bayou

Cross sections are currently being surveyed along the 6,400 foot section of Locust Bayou that was dredged to the depth of -6.0 ft NGVD. This work is being performed by Acadian Engineers and Environmental Consultants, Inc. as part of the small dredge project survey described above. A determination as to the condition of the areas dredged in Locust Bayou will be available once surveys are completed.

Other Areas Inspected

Existing pipeline canal plug – A small breach was observed at the west end of an existing pipeline canal plug constructed of a timber bulkhead, shell, and rock. This pipeline canal plug is located along the north bank of the canal that leads to Site No. 6 approximately 1,500 feet west of Site No. 6. It should be monitored on future site visits.

Breaches along Cox Canal Bank – Two breaches were observed along the south bank of Cox Canal (canal that leads to Site No. 5). Horizontal positions of the breaches were taken using a hand-held GPS unit. The first breach is located at approximate coordinates latitude 29° 16' 33.6", longitude 91° 14' 36.4". The breach appeared to be approximately 50 feet wide, and depth measurements taken near the center indicated the breach was approximately 3.5 feet deep. With the observed water level reading of -0.23 ft NAVD at the time of inspection, the bottom elevation near the center would be approximately -3.7 ft NAVD. The second breach is located at approximate coordinates latitude 29° 16' 36.2", longitude 91° 14' 31.5". This breach appeared to be approximately 20 feet wide with the bottom elevation approximately 0.5 feet above water level or at elevation +0.3 ft NAVD based on the observed water level reading of -0.23 ft NAVD at the time of inspection.

June 2000 Repair/Maintenance of spoil bank areas – A small breach was observed in the east bank of the canal located just west of Site No. 9 at the site of previous maintenance spoil bank work (breach site 8). The breach appeared to be approximately 10 feet wide and is located at approximate coordinates latitude 29° 17' 13.2", longitude 91° 17' 02.0". The other sites of this repair project including the rock weir construction (breach site 3) appeared to be in good condition.

Sediment Input Area

The sediment input area was not inspected due to its remote location.

c. Proposed Maintenance

While no maintenance efforts on the rock plugs are recommended at this time, it is recommended that a survey be performed on the rock plugs.

All of the existing buoy systems were damaged and are to be replaced by permanent barricade systems which were designed by Picciola and Associates, Inc. of Cutoff, Louisiana. The permanent barricade design consists of timber piles and galvanized steel pipe horizontal members. Construction should be completed by late 2004.

A proposed dedicated dredging project is currently under design to fill the pipeline corridor from the Atchafalaya Bay to the Lake Chapeau disposal area. The project will utilize previously permitted spoil material from the Atchafalaya Bay to create approximately 150 acres of new marsh west of the Lake Chapeau disposal site and to repair an existing breach along the shoreline of the Atchafalay Bay at the entrance of the pipeline corridor.

This annual inspection was an evaluation of the physical integrity of the constructed project features and does not represent an analysis of the overall effectiveness of the project. Should monitoring data collected in the field show that the deficiencies outlined in inspection results of this report are having an adverse affect on the performance of the project, the conclusion and recommendation concerning maintenance objectives may change.

III. Operation Activity

There are no features in this project that require operations therefore, there is no operation activity.

IV. Monitoring Activity

a. Project Objective and Goals:

The objectives of the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project are to convert approximately 260 ac (105 ha) of open water to marsh at a mean elevation of 1.0 ft (0.3 m) National Geodetic Vertical Datum of 1929 (NGVD29) west of Lake Chapeau between the Locust Bayou and Alligator Bayou watersheds using sediment mined from Atchafalaya Bay, and to restore natural sediment and hydrologic pathways by plugging canals in the project area.

The following goals will contribute to the evaluation of the above objectives:

1. Create approximately 260 ac (105 ha) of marsh west of Lake Chapeau.
2. Decrease the water level variability within the project area.

b. Monitoring Elements:

Habitat Mapping

Color-infrared aerial photography (1:24,000 scale) will be obtained for project and reference areas in order to document vegetated and non-vegetated areas, changes in vegetative community type, and submerged aquatic vegetation. The photography will be photo-interpreted, scanned, mosaicked, geo-rectified, and analyzed by National Wetlands Research Center (NWRC) personnel according to a standard operating procedure. Photography was obtained in 1994, 1997 (pre-construction), and 2001 (post-construction) and will be collected in 2010. Habitat mapping will be conducted on the 1994, 1997, and 2001 photography, however based on the Coastwide Reference Monitoring Station (CRMS) review, only a land:water analysis will be conducted on the 2010 photography.

Water Level

To monitor water level variability, two continuous recorders were located within the project area and one recorder was located in each of the two reference sites. Water level was recorded hourly. Mean daily water level variability has been monitored continuously prior to construction in 1997-1998, after construction in 1999 through 2003, and will continue in 2004 through 2016. In addition, flooding duration and frequency of flooding in the project area and reference sites will be evaluated. The location of sampling stations may be adjusted by DNR/CRD based on interpretation of preliminary data acquired from the area.

Vegetation

Species composition, and percent cover were determined in thirteen randomly selected 4 m^2 (6.6 ft^2) Braun-Blanquet plots for the dredge fill area in order to monitor the plantings. Seven reference plots and five project plots were sampled in 1999 and 2001 according to a standard operating procedure. Species composition and percent cover was evaluated in the late summer or early fall, prior to plant senescence (from July 15 to September 15). Each plot was

marked with a pvc pole on the southeast corner to allow personnel to revisit them over time. Data collection will occur again in 2004, 2007, 2010, 2013, and 2016.

c. Monitoring Data:

i. Habitat Mapping

Habitat Mapping

The USGS/NWRC in Lafayette has completed scanning, geo-rectification and the production of photomosaics for aerial photography flown in 1994, 1997, and 2001. Photography was scanned in at 300 dots per inch on a sharp JX-610 scanner using WScanNT® software for the personal computer and stored as .TIFF images. ERDAS Imagine®, an image processing and geographic information systems (GIS) software package was used to geo-rectify individual frames of photography. The scanned images were assembled into a photomosaic and overlaid onto a geo-referenced image (such as SPOT imagery and DOQQ imagery) of the same area to rectify it. Photo-interpretation of the project and reference areas was completed and draft hard copies of the maps were produced and sent to the Louisiana Department of Natural Resources, Coastal Restoration Division, Thibodaux Field Office (LDNR/CRD/TFO) for review. Comments were sent back to NWRC and edits were made to the preliminary drafts. A final draft was sent to LDNR/CRD/TFO for final comments and review. Analysis yielded pre-construction acreages for the habitat classes found in the project and reference areas and the acreages of land to water in these same areas.

Land:water analysis for aerial photography flown in 2001 (post-construction) was completed in 2003 by NWRC in Lafayette for the fill area. A photomosaic was produced for the entire project area and the two reference areas for this flight and final habitat analysis for this is complete.

Figures:

Figure 2. 1994 & 1997 photomosaics of the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Figure 3. 2001 photomosaic of the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Figure 4. 1994 land:water analysis map of the fill area for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Figure 5. 2001 land:water analysis map of the fill area for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Figure 6. 1956 land:water analysis map of the project area for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Tables

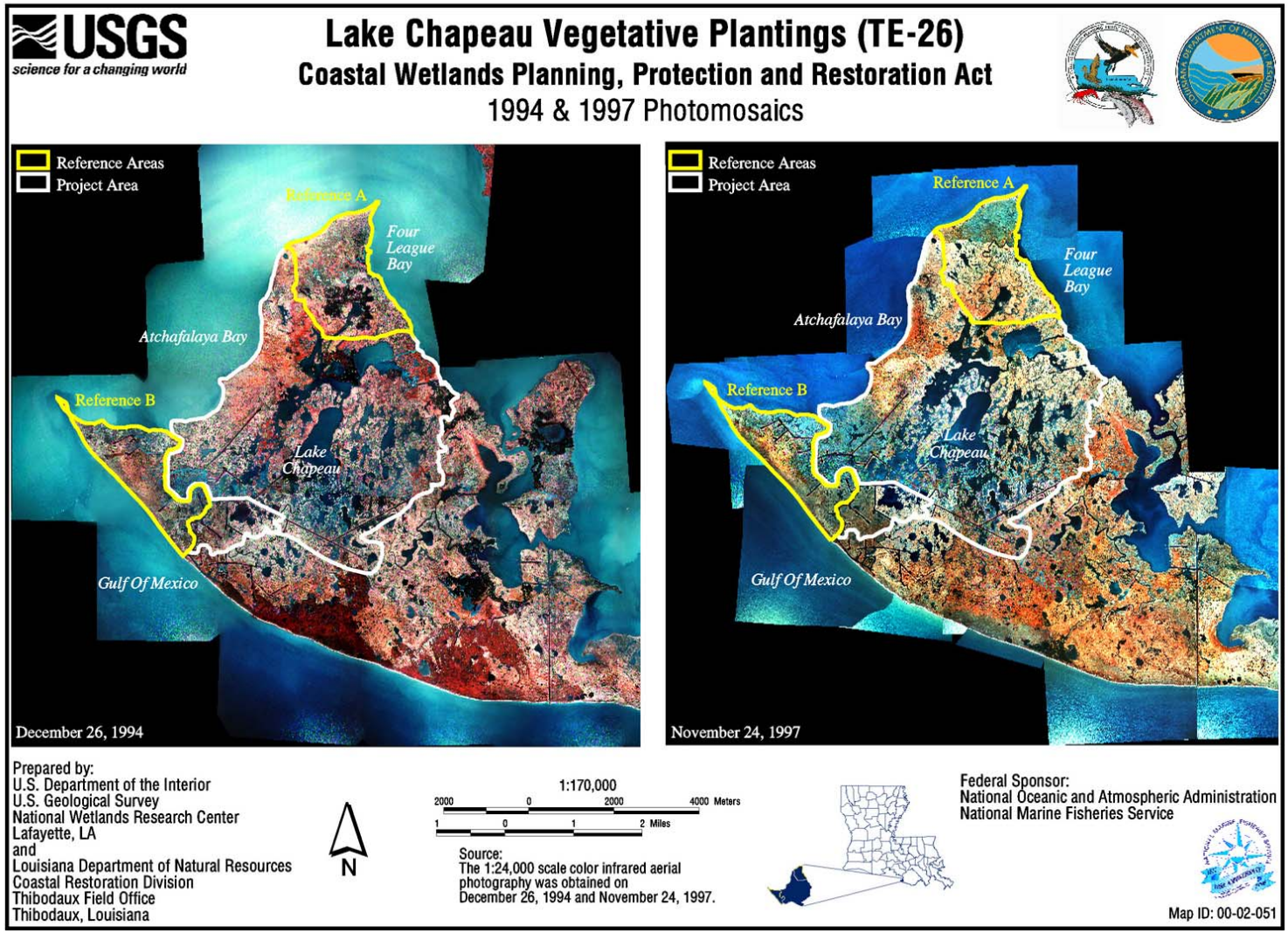

Figure 2. 1994 and 1997 photomosaics for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

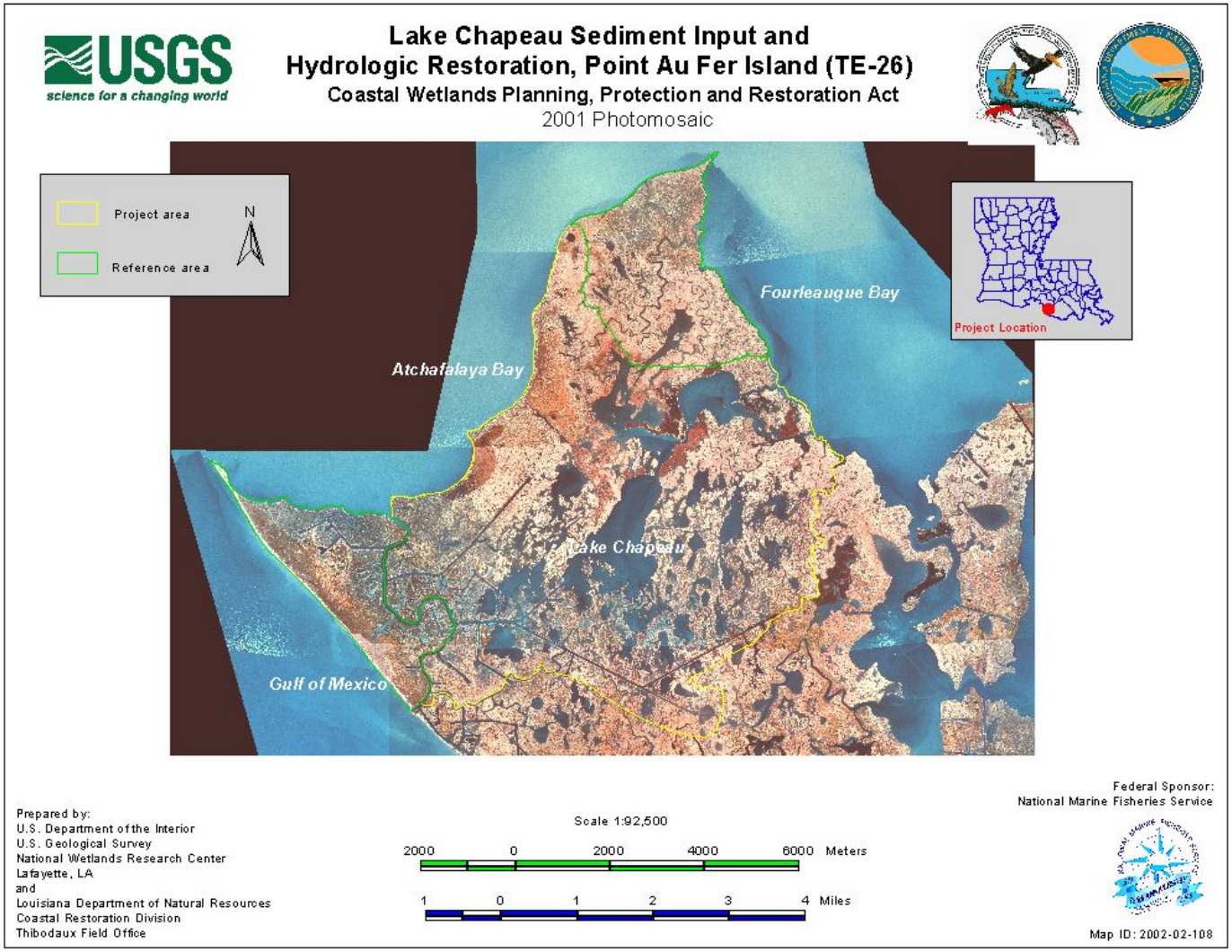

Figure 3. 2001 photomosaic for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

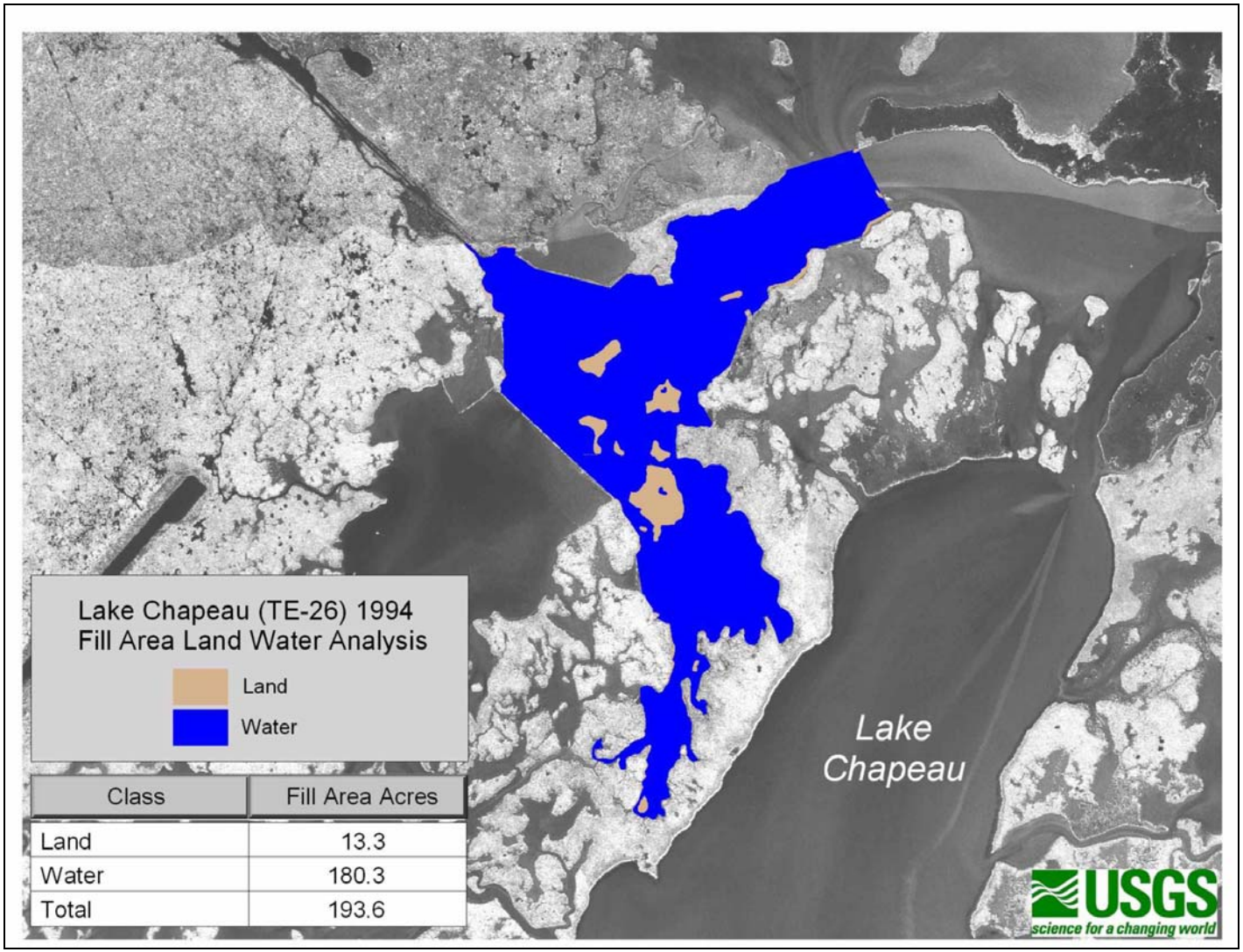

Figure 4. 1994 fill area land-water analysis for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer project.

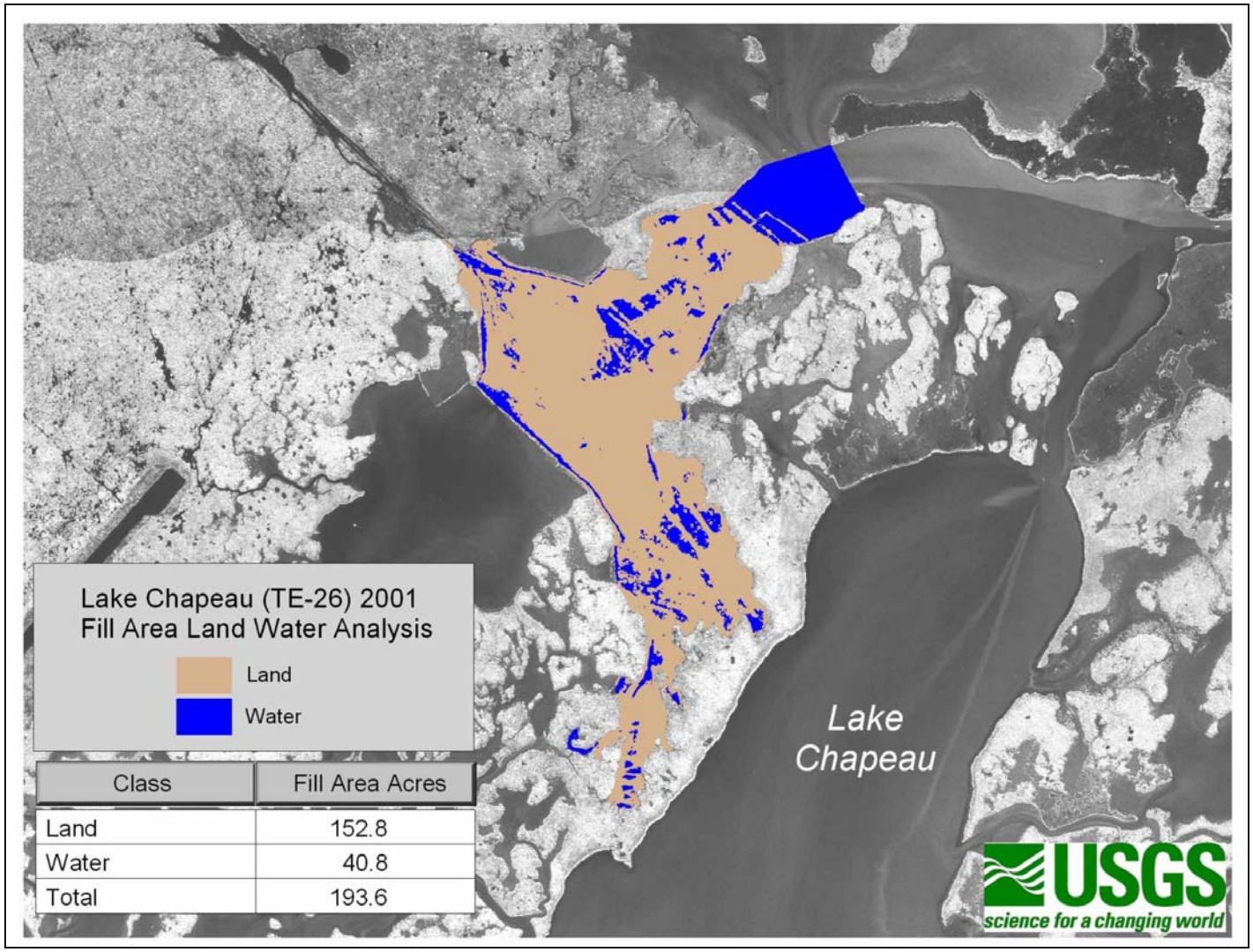

Figure 5. 2001 fill area land-water analysis for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project

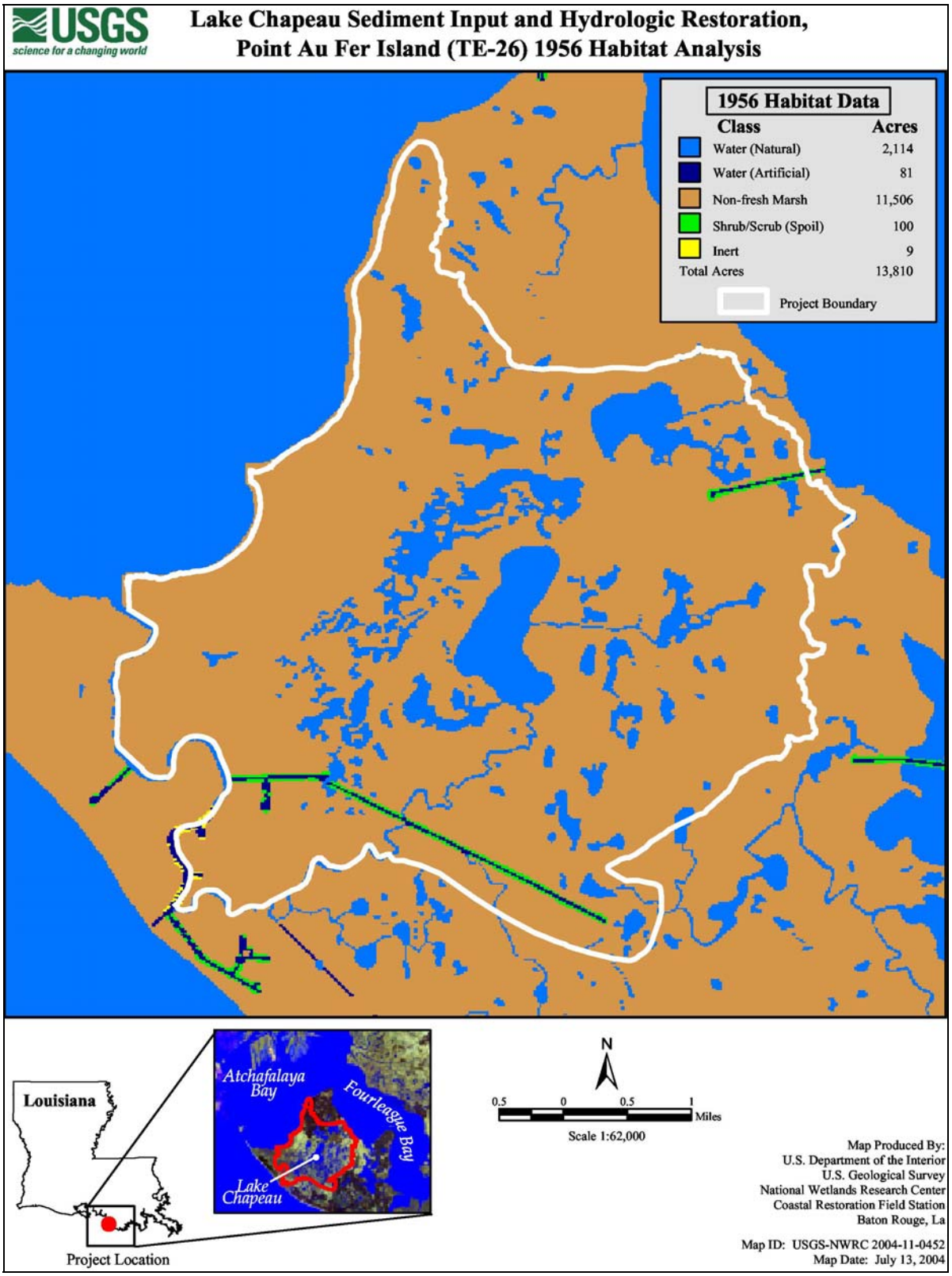

Figure 6. 1956 habitat analysis of the Lake Chapeau Sediment input and Hydrologic Restoration (TE-26), Point Au Fer Island project area.

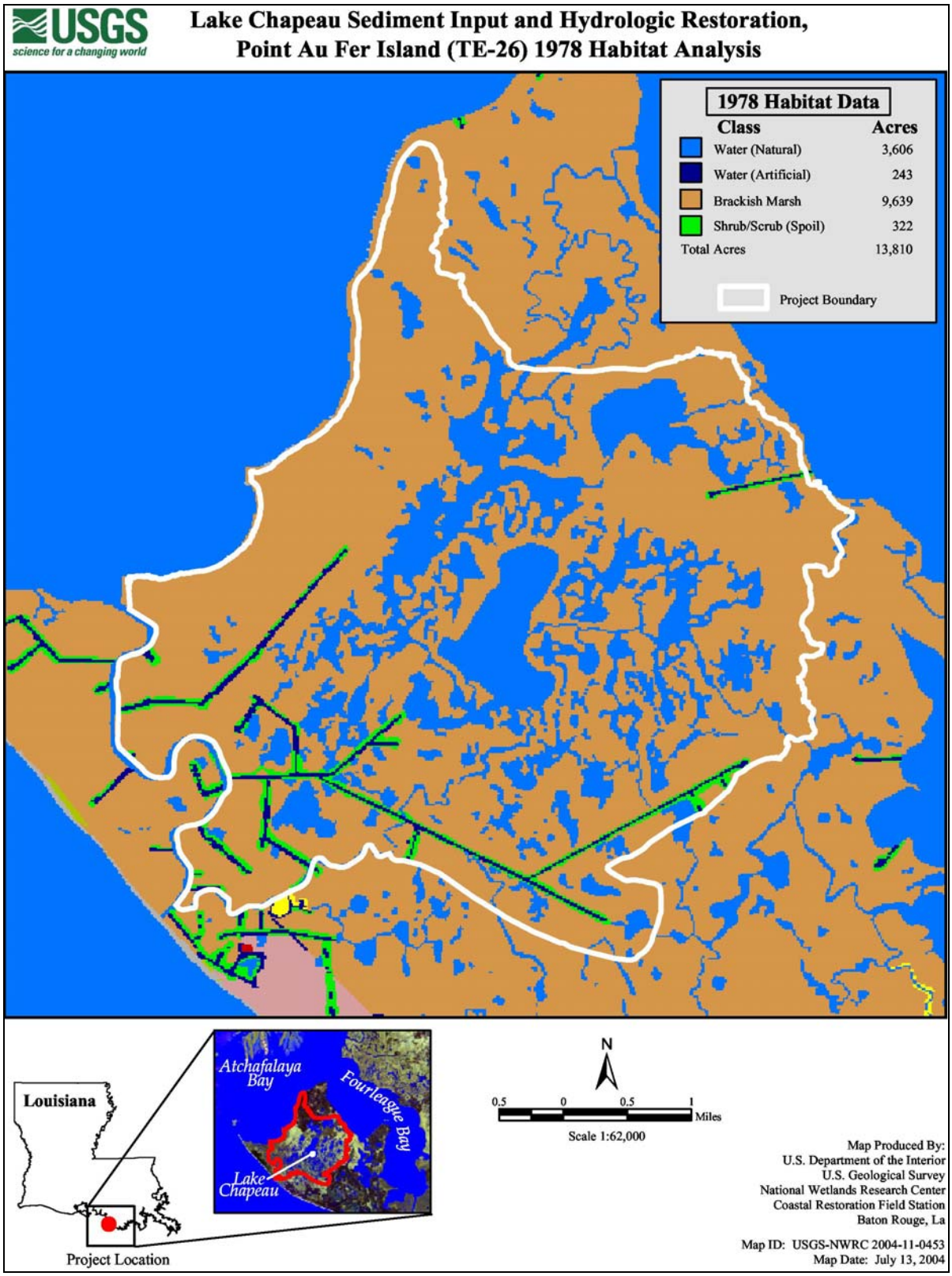

Figure 7. 1978 habitat analysis map of the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project area.

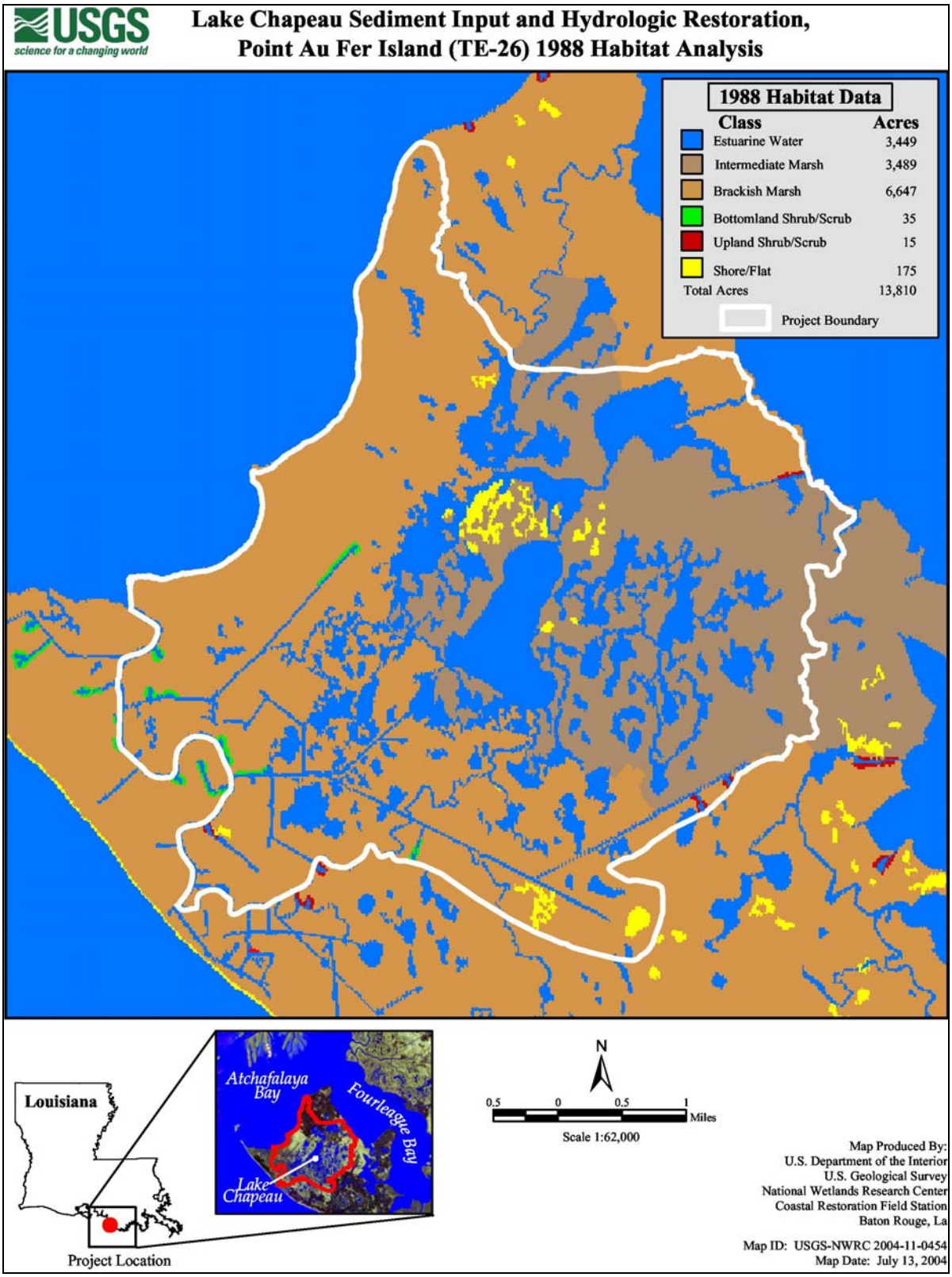

Figure 8. 1988 habitat analysis of the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project area.

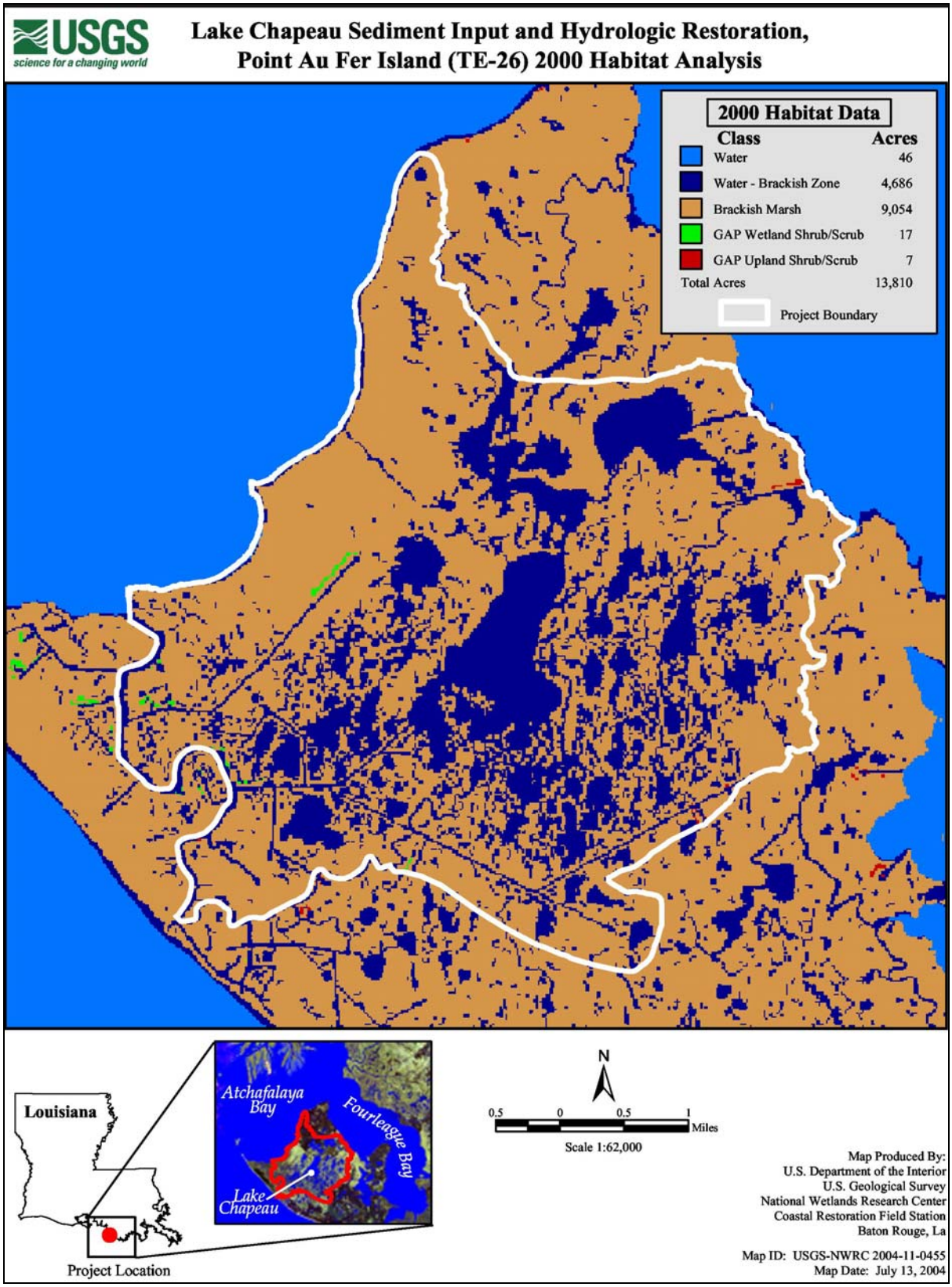

Figure 9. 2000 habitat analysis of the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project area.

Table 1. 1994 Habitat Analysis Results for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island Project.

	1994 Habitat Analysis Results		
Habitat Class	**Project Acres**	**Reference 1 Acres**	**Reference 2 Acres**
Open Water Salt	5411.7	365.2	381.7
Mud Flat Salt	307.9	29.3	52.2
Marsh Salt	7870.1	1526.2	2131.6
Wetland Scrub Shrub Fresh	0	10.7	0
Wetland Scrub Shrub Salt	68.3	28.7	13.6
Agriculture/Range	12.6	9.3	0
Upland Scrub Shrub	138.1	61.2	2.5
Upland Barren	0.4	4.9	0
Urban	0.5	0	0
Total	13809.6	2035.5	2581.6

Table 2. 1997 Habitat Analysis Results for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island Project.

	1997 Habitat Analysis Results		
Habitat Class	**Project Acres**	**Reference 1 Acres**	**Reference 2 Acres**
Open Water Salt	5667.9	392.4	417
Mud Flat Salt	231.8	50.2	36
Marsh Salt	7603.8	1464.2	2105.9
Wetland Scrub Shrub Fresh	0	0	0
Wetland Scrub Shrub Salt	113.9	30.5	20.3
Agriculture/Range	5.6	4.5	0
Upland Scrub Shrub	180.8	87.4	2.3
Upland Barren	5.6	6.3	0
Urban	0.2	0	0
Total	13809.6	2035.5	2581.5

Table 3. 2001 Habitat Analysis Results for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island Project.

	2001 Habitat Analysis Results		
Habitat Class	**Project Acres**	**Reference 1 Acres**	**Reference 2 Acres**
Open Water Salt	5426.5	392.3	440.3
Mud Flat Salt	258.6	42.8	42.9
Marsh Salt	7841.8	1493.6	2086.5
Wetland Scrub Shrub Fresh	0	0	0
Wetland Scrub Shrub Salt	100.3	19.6	9.7
Agriculture/Range	0	0	0
Upland Scrub Shrub	174.7	62.3	2.2
Upland Barren	7.4	24.8	0
Urban	0.5	0	0
Total	13809.8	2035.4	2581.6

Table 4. Land to water acreages inside the (TE-26) Lake Chapeau Sediment Input and Hydrologic Restoration, Point Au Fer Island project boundary.

	1956	**1978**	**1988**	**1997**	**2000**	**2001**
Land	11615	9961	10361	8142	9078	8383
Water	2195	3849	3449	5668	4732	5427
Total	13810	13810	13810	13810	13810	13810

c. Monitoring Data: (continued)

ii. Water Level

Water Level

Hourly water level data have been collected at the following continuous recorder stations: (Table 5)

Station	Data collection period
TE26-01R	04/24/1997– present
TE26-02R	04/24/1997 – present
TE26-03	04/24/1997 – present
TE26-05	01/20/1998 – present

Discrete staff gauge readings were recorded during each data collection trip for the time span each station has been active.

All of the water level data are in the process of adjustment to a new elevation survey conducted in 2003 in order to tie the data into the DNR secondary network of monuments. Installation of four new staff gauges to replace the old ones at each of the continuous recorder stations has been contracted out and is complete. The GPS static survey scope for this contract required the adjustment of each staff gauge and nail elevation at each sonde station to the South Louisiana Coastal Wetland(SLCW) GPS network.

Figures and Tables:

Figure 10. Location map of continuous recorder stations for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

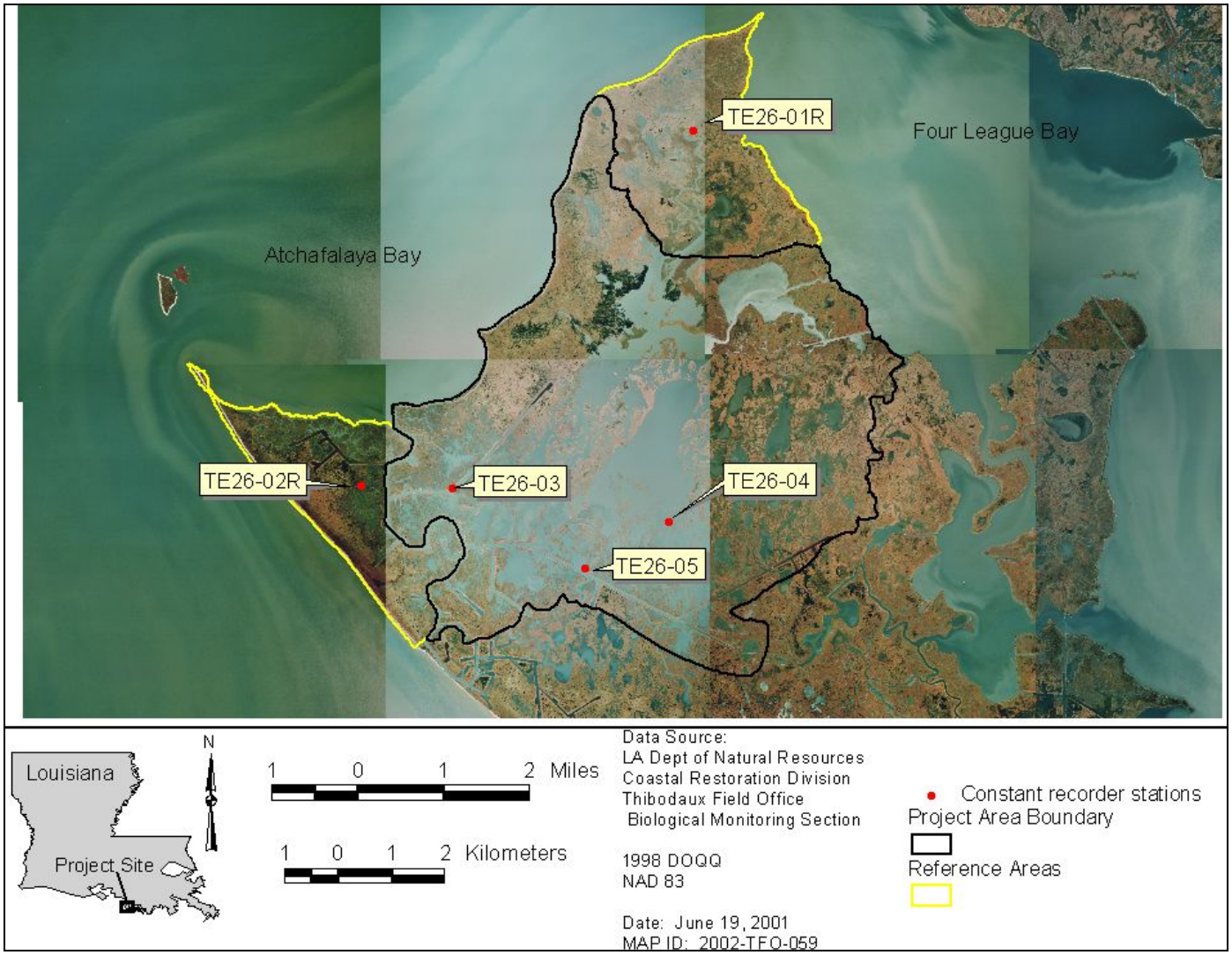

Figure 10. Location map for continuous recorder stations for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

c. Monitoring Data: (continued)

iii. Vegetation

Vegetation:

Species composition and percent cover were determined for seven reference plots and five project plots for the fill area in 1999 and 2001. Emergent vegetation data collection was not slated for the 2003 sampling year, however data collection will resume in 2004. For this report, the 1999 and 2001 data will be presented. Additional comparative analysis will occur once the 2004 data collection is complete.

The corner poles for three reference plots and one project plot established in 1999 were missing when DNR personnel revisited the site for data collection in 2001. These four stations were inactivated and four new stations were established as close to the old plots as possible using the DGPS equipment (table 6).

Figures:

Figure 11. Location map of randomly selected vegetation plots for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Figure 12. Bar graph indicating percent cover of selected species for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Figure 13. Bar graph indicating total relative percent cover by species and project and reference plots for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

Figure 14. Bar graph indicating estimated relative cover of all species in 1999 for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

Figure 15. Bar graph indicating estimated relative cover of all species in 2001 for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26) Point Au Fer Island project.

Tables:

Table 6. Vegetation data collection stations for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Table 7. Estimated mean cover for each species inside the 2 x 2 meter Braun-Blanquet project and reference plots by year for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

Table 8. Estimated mean cover and estimated total percent cover listed by station for Project and Reference plots by sample year within 2x2 meter Braun Blaunqet vegetation plots at Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

Table 9. Estimated mean percent cover for all species occurring inside the project and reference 2x2 meter Braun Blaunqet vegetation plots by sample year at Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

Table 6. Vegetation data collection stations for the Lake Chapeau Sediment Input and Hydrologic Restoration, (TE-26) Point Au Fer Island project.

Station	Fall Vegetation Data Collection
TE26-11	1999, 2001
TE26-12	1999, 2001
TE26-13	1999, 2001
TE26-14	1999*
TE26-15	1999, 2001
TE26-21R	1999*
TE26-22R	1999*
TE26-23R	1999, 2001
TE26-24R	1999, 2001
TE26-25R	1999, 2001
TE26-26R	1999*
TE26-27R	1999, 2001
TE26-28	2001
TE26-29R	2001
TE26-30R	2001
TE26-31R	2001

* Stations TE26-14, TE26-21R, TE26-22R, and TE26-26R were inactivated in 2001 and replaced with stations TE26-28, TE26-30R, TE26-29R, and TE26-31R respectively.

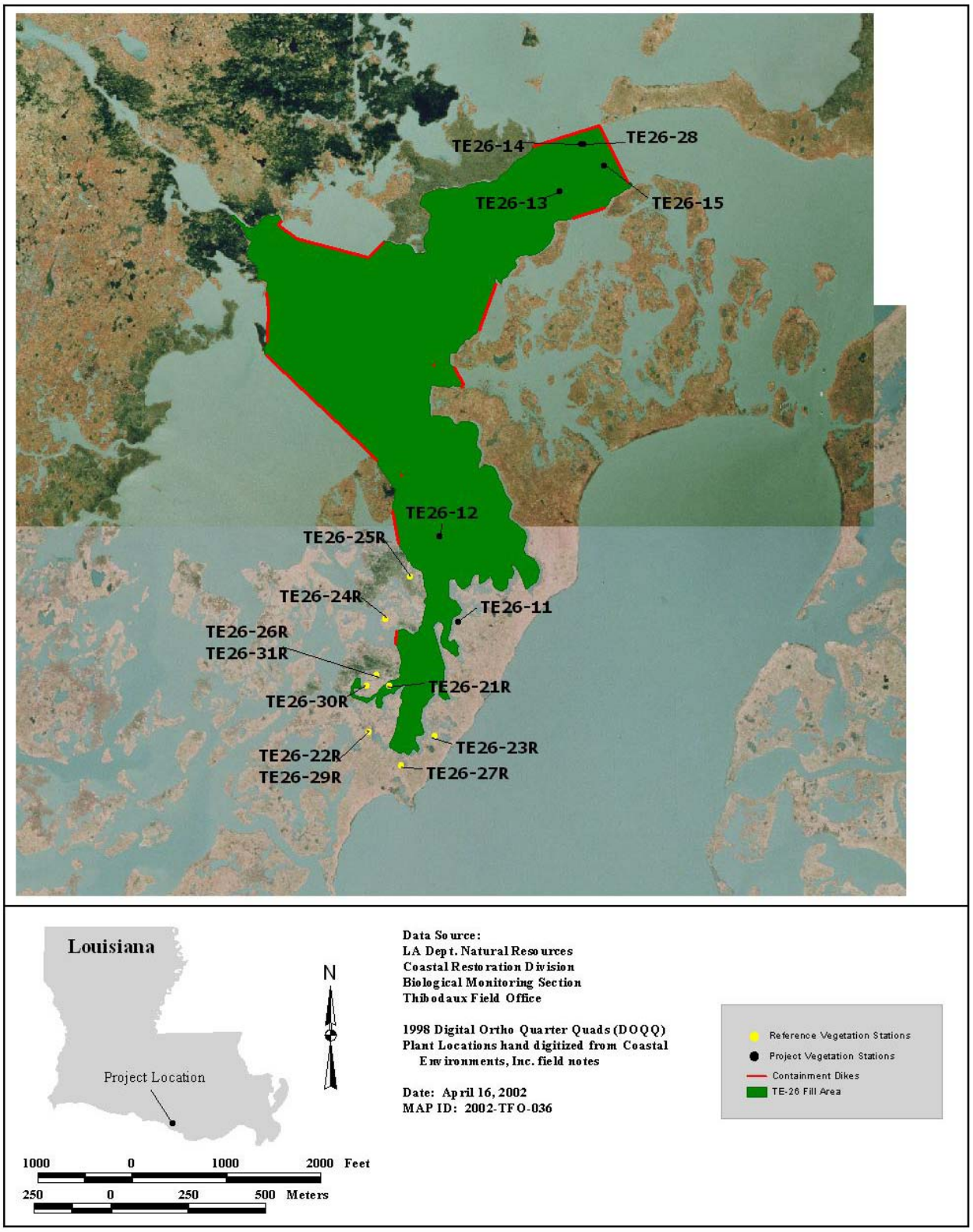

Figure 11. Location map of vegetation data collection stations for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

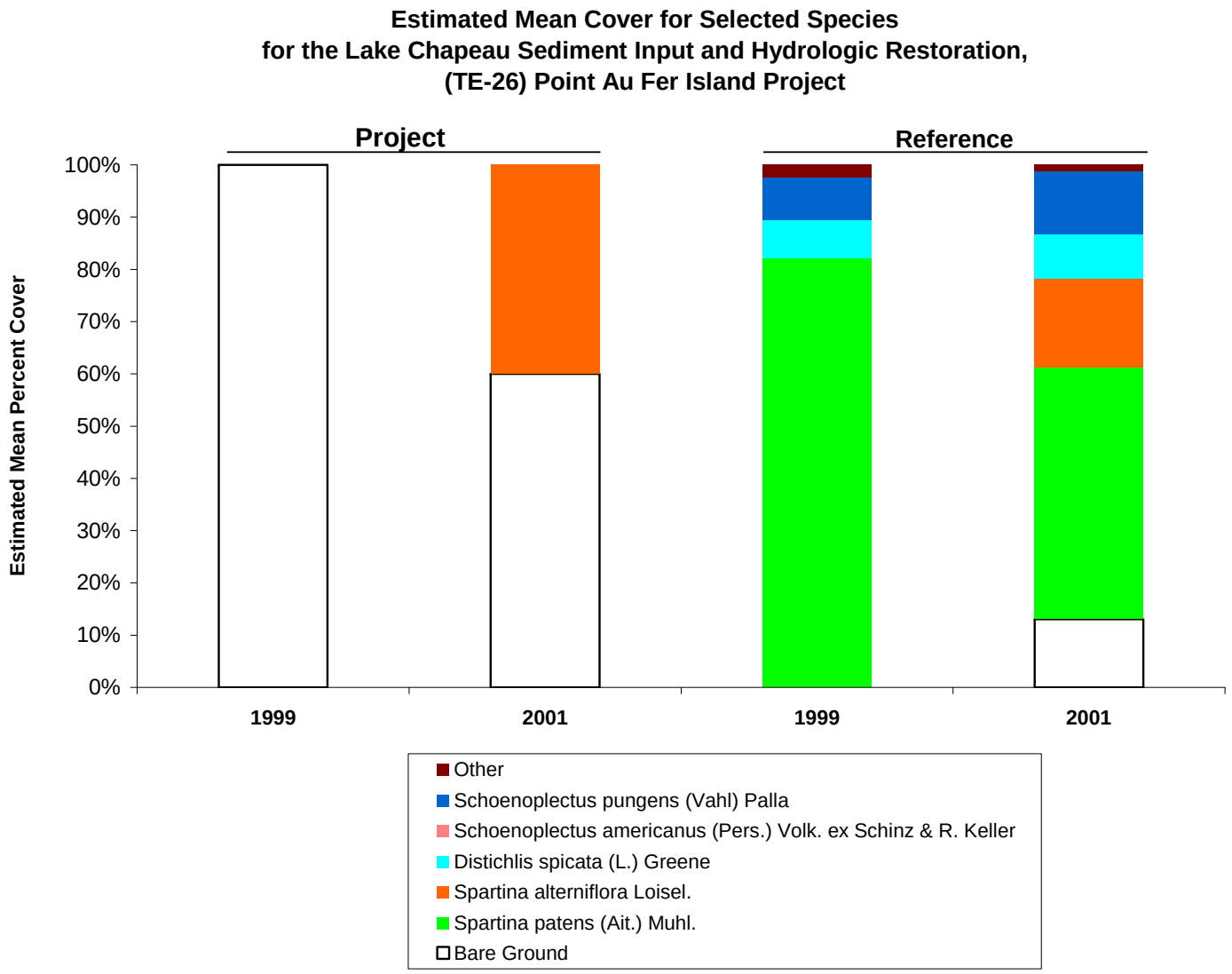

Figure 12. Estimated Mean cover of selected emergent vegetation species for the fall 1999 and fall 2001 at the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

Table 7. Estimated mean cover for each species inside the 2 x 2 meter Braun-Blanquet project and reference plots by year for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

	Project		Reference	
	1999	2001	1999	2001
Species	Mean Cover	Mean Cover	Mean Cover	Mean Cover
Bare Ground	100.00	60.00	0.00	16.43
Distichlis spicata (L.) Greene	0.00	0.00	7.43	10.71
Ipomoea sagittata Poir.	0.00	0.00	0.14	0.71
Lythrum lineare L.	0.00	0.00	0.00	0.07
Pluchea odorata (L.) Cass.	0.00	0.00	1.14	0.00
Schoenoplectus americanus (Pers.) Volk. ex Schinz & R. Keller	0.00	0.00	0.00	0.00
Schoenoplectus pungens (Vahl) Palla	0.00	0.00	8.29	15.07
Spartina alterniflora Loisel.	0.00	40.00	0.00	21.43
Spartina patens (Ait.) Muhl.	0.00	0.00	83.57	60.71
Symphyotrichum tenuifolium (L.) Nesom	0.00	0.00	0.71	0.73
Vigna luteola (Jacq.) Benth.	0.00	0.00	0.43	0.00

Table 8. Estimated mean cover and estimated total percent cover listed by station for Project and Reference plots by sample year within 2x2 meter Braun Blaunqet vegetation plots at Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

Project				Reference			
1999		2001		1999		2001	
Station	Total % Cover	Station	Total % Cover	Station	Total % Cover	Station	Total % Cover
TE26-11	0	TE26-11	100	TE26-21R	100	TE26-30R	100
TE26-12	0	TE26-12	100	TE26-22R	100	TE26-29R	85
TE26-13	0	TE26-13	0	TE26-23R	60	TE26-23R	100
TE26-14	0	TE26-28	0	TE26-24R	95	TE26-24R	100
TE26-15	0	TE26-15	0	TE26-25R	100	TE26-25R	100
				TE26-26R	100	TE26-31R	0
				TE26-27R	80	TE26-27R	100
Mean % Cover	0		40		91		84

Table 9. Estimated mean percent cover for all species occurring inside the project and reference 2x2 meter Braun Blaunqet vegetation plots by sample year at Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

	Project				Reference			
	1999		2001		1999		2001	
Species	**% Stations**	**Mean Cover**	**% Stations**	**Mean Cover**	**% Stations**	**Mean Cover**	**% Stations**	**Mean Cover**
Bare ground	100	100	60	100			29	58
Distichlis spicata					100	7	29	38
Ipomoea sagittata					14	1	14	5
Lythrum lineara							14	1
Pluchea odorata					29	4		
Scirpus americanus					100	8	71	21
Spartina alterniflora [a]			40	100			29	75
Spartina patens					100	84	71	85
Symphyotrichum tenuifolium					57	1	29	3
Vigna luteola					14	3		

[a]approximately 46,980 plugs of *Spartina alterniflora* were planted within the dredge material fill area in Spring 2000.

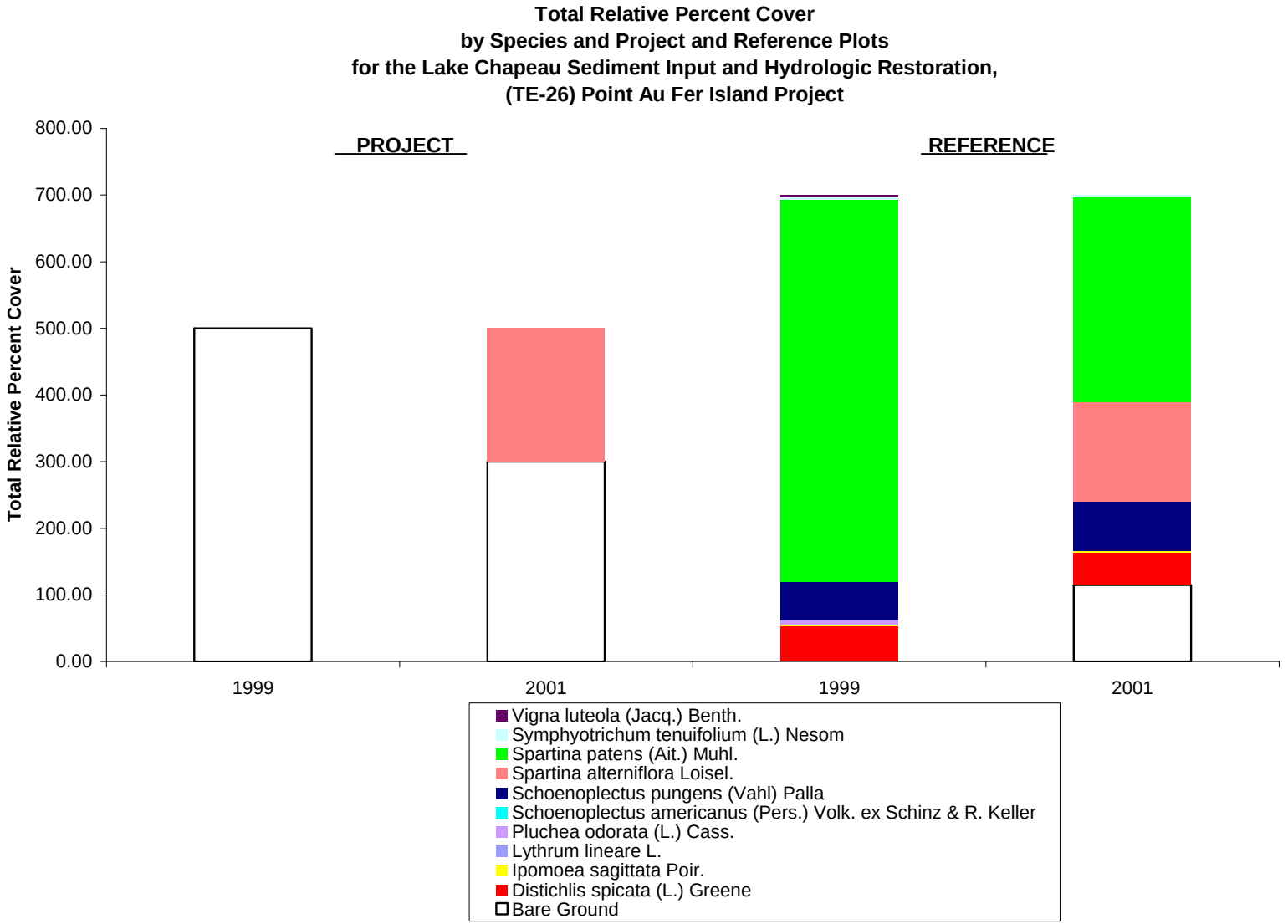

Figure 13. Total relative percent cover by species and project and reference plots for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

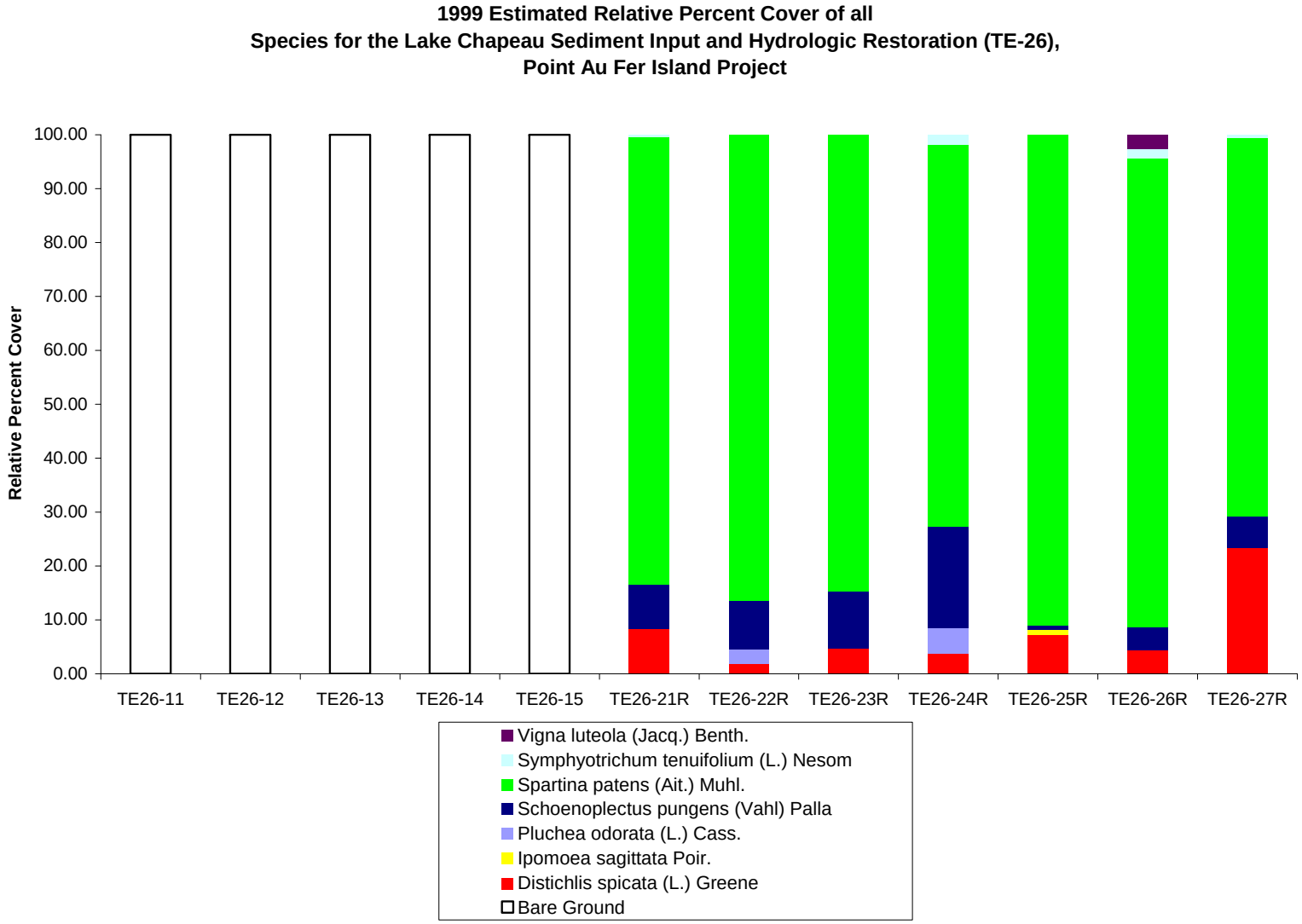

Figure 14. Estimated relative cover of all species in 1999 for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26), Point Au Fer Island project.

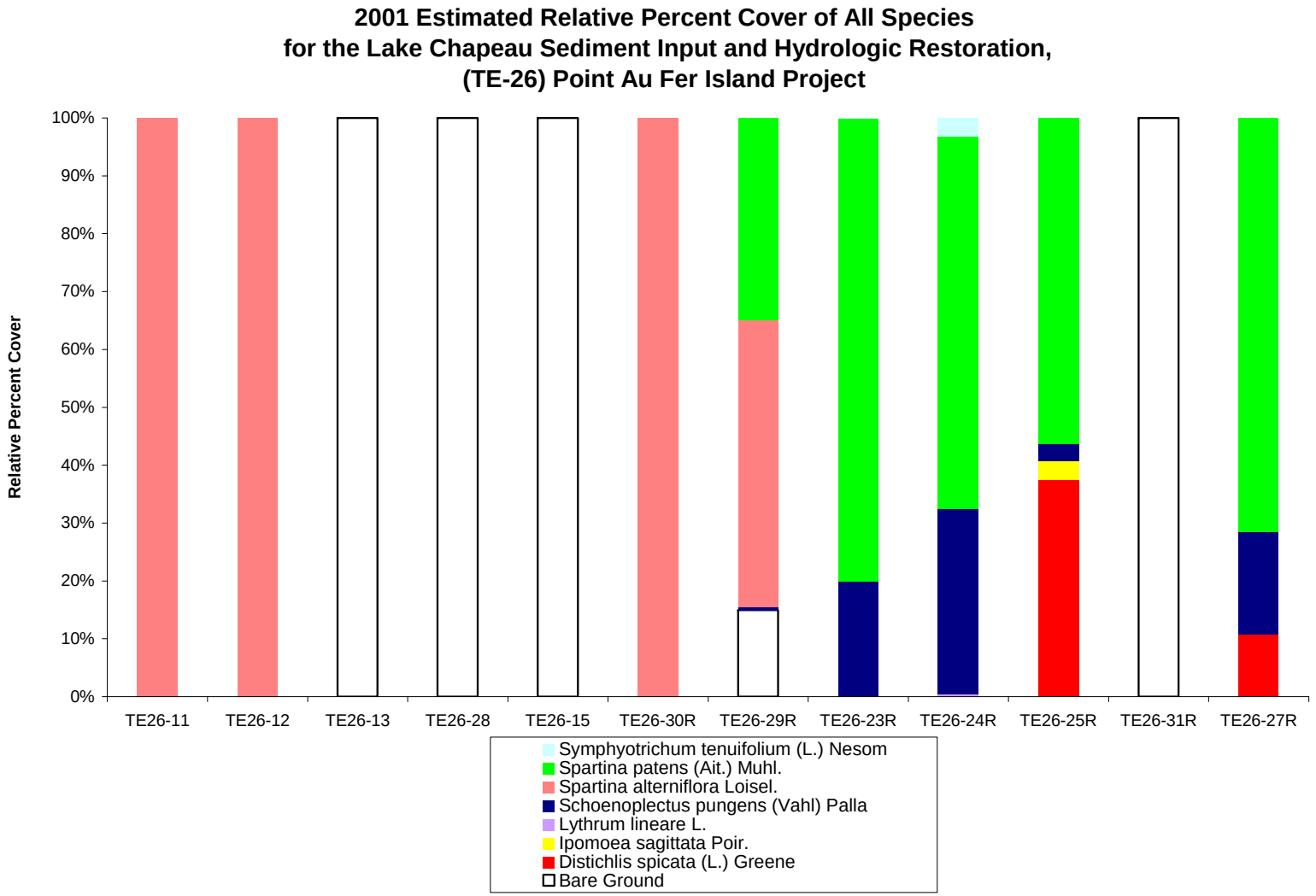

Figure 15. Estimated relative cover of all species in 2001 for the Lake Chapeau Sediment Input and Hydrologic Restoration (TE-26) Point Au Fer Island project.

IV. Monitoring Activity: (continued)

d. Preliminary Monitoring Results and discussions

Habitat Mapping

Fill area land:water analysis indicates that the acreage of land increased by 139.5 (56.5 ha) acres between 1994 and 2001, while the acreage of water correspondingly decreased (figures 4-5).

The most recent habitat analysis indicates the acreage of open water inside the project area boundary increased by approximately 256.2 ac (103.7 ha) between 1994 and 1997 (5 years pre-construction), and it decreased by approximately 241.4 ac (97.7 ha) between 1997 and 2001 (two years post-construction) (tables 1-3). The salt marsh habitat class decreased by approximately 266.3 ac (107.8 ha) between 1994 and 1997 (5 years pre-construction), and it increased by approximately 238 ac (96.3 ha) between 1997 and 2001 (two years post-construction).

Habitat analysis indicates the acreage of open water inside reference area 1 increased by approximately 27.2 ac (11 ha) between 1994 and 1997 (5 years pre-construction), and it decreased by approximately 0.1 ac (0.04 ha) between 1997 and 2001 (two years post-construction) (tables 1-3). The salt marsh habitat class decreased by approximately 62 ac (25.1 ha) between 1994 and 1997 (5 years pre-construction), and it increased by approximately 29.4 ac (11.9 ha) between 1997 and 2001 (two years post-construction).

Habitat analysis indicates the acreage of open water inside reference area 2 decreased by approximately 35.3 ac (14.3 ha) between 1994 and 1997 (5 years pre-construction), and it increased by approximately 23.3 ac (9.4 ha) between 1997 and 2001 (two years post-construction) (tables 1-3). The salt marsh habitat class decreased by approximately 25.7 ac (10.4 ha) between 1994 and 1997 (5 years pre-construction), and it decreased by approximately 19.4 ac (7.9 ha) between 1997 and 2001 (two years post-construction).

Land-water analysis (figures 6-9; table 4) inside the project boundary indicates a net gain of land between 1997 and 2000, which can be explained by the dredge disposal area created in 1998. However, interior land loss inside the project boundary resumes between 2000 and 2001.

Water Level

Water level analysis for data collected on this project is incomplete. The water level data are currently being adjusted to the 2003 elevation survey datum.

Vegetation

Estimated mean percent cover: project versus reference

Vegetation analysis indicates that in fall 1999 (one growing season post-construction) all five project plots were 100% bare ground (figure 12; table 7). Field observations also indicate that three of the five project plots were in open water, despite the fact that dredge material placement had already occurred. Conversely, the reference plots had 100% estimated mean

cover with a predominance of *Spartina patens* (Ait.) Muhl. (marshhay cordgrass), followed by *Schoenoplectus pungens* (Vahl) Palla (common threesquare), and *Distichlis spicata* (L.) Greene (seashore saltgrass).

In the fall of 2001 (three growing seasons post-construction; two growing seasons post-planting) the five project plots had an estimated mean cover of 60% bare ground and 40% estimated mean cover of the planted species, *S. alterniflora* (figure 12; table 7). Field observations confirm that three of the project plots remained open water. None of the project plots contained natural recruitment of species from the surrounding marshes. In contrast, the seven reference plots continued to show some species diversity with *S. patens* still the predominant species, followed by the planted species *S. alterniflora* which appears to have spread to the natural marsh from the adjacent fill area, followed by *Schoenoplectus* spp, and *D. spicata*. Interestingly, bare ground was present in the reference plots during this sampling period where there was no bare ground present in 1999. Also, the estimated mean cover of *S. patens* decreased by approximately 23% in the reference plots from approximately 84% to approximately 61% while the estimated mean cover of *S. pungens* increased slightly from approximately 8% to approximately 15%.

Estimated mean cover based upon total station cover and by percent of stations: project versus reference

Estimated mean cover for the project plots one growing season post-construction (1999) was 0% while mean cover for the reference plots was 91% (table 6). In the reference plots *S. patens* was present in 100% of the stations with the highest mean cover value of 84% out of 7 species present (table 8). *D. spicata* and *S. pungens* were also present in 100% of the stations, but their mean cover values were 7% and 8% respectively, not nearly as high as *S. patens*. It is important to note that *S. alterniflora* plantings were installed throughout the fill area in May 2000 due to the lack of natural vegetation recruitment observed one growing season post-construction.

Estimated mean cover for the project plots three growing seasons post-construction (2001) was 40% while mean cover for the reference plots was 84% (Table 6). Only the planted species was present in the project plots however the percent cover value was 100% where it did occur (Table 7). In the reference plots *S. patens* was present in 71% of the stations with the highest mean cover value of 85% out of 7 species present (table 8). Compared to 1999, *D. spicata* and *S. pungens* were present at fewer stations, 29% and 71% respectively. However their mean percent cover values increased to 38% and 21%. *S. alterniflora* was present in 29% of the stations with a mean cover value of 75%. Its presence indicated some natural recruitment from the planted fill area into the adjacent natural marsh.

Estimated total relative cover of species by year and project and reference plots; relative mean percent cover of species by station and year

In 1999, one growing season post-construction, all five of the project plots were devoid of vegetation with 0% total relative cover, or 100% bare ground (figures 13-14). Three of the five project plots were open water. The seven reference plots contained predominately *S.*

patens with a total relative cover of approximately 570% with smaller total relative percentages of *S. pungens*, *D. spicata* and other species.

By the fall of 2001 (3 growing seasons post-construction; 2 growing seasons post-planting), the five project plots had a combined relative percent cover of approximately 200% *S. alterniflora* (figure 13). Three of the five project plots remained open water with 0% relative mean cover, while two of them each contained approximately 100% relative mean cover of the planted species, *S. alterniflora* (figure 15). Total relative cover of the dominant species, *S. patens* decreased substantially to approximately 300 % in the seven reference plots, while recruitment of the planted species into some of these plots resulted in a total relative cover of approximately 150% (figure 13). Total relative cover of *Schoenoplectus* sp. and D. *spicata* remained approximately the same in the reference plots by fall 2001.

V. Conclusions

a. Project Effectiveness

Creation of the dredge fill area and the subsequent installation of *S. alterniflora* plantings has resulted in a gain of 139.5 acres (56.5 ha) inside the project area which points to some project success. However, whether this fill area has recreated a separation of the Alligator bayou and Locust bayou watersheds enough to restore some of the historical hydrology remains inconclusive. Additionally, land water analysis indicates continued land loss inside the project boundary.

Not enough water level and salinity data analysis have been collected to determine project effectiveness.

Vegetation data analysis of the 1999 (as-built) and 2001 post-construction data sets indicate the dredge fill area has successfully vegetated with planted *S. alterniflora* along with other naturally occurring species. Evidence also shows the planted species established itself inside some of the reference plots.

b. Recommended Improvements

Water level and salinity data are needed for the southern portions of the project area therefore continuous recorder concentrations need to be shifted.

c. Lessons Learned

Engineering:

- Pre-project data were not collected for hydrologic modeling.
- There was no hydrologic modeling for this project. Through information provided in the 1995 Environmental Assessment the hydrology of the island is historically known. There are indications from the Operations and Maintenance Inspection Report of 2004 that repeated spoil bank blowouts in the southwestern portion of the project (sites 7, 9, and breach #3) point to a large volume of water pushing through broken marshes south

of Lake Chapeau, skipping the historical circuitous flow from Lake Chapeau south, through Locust Bayou west, and then north to the Atchafalaya Bay.

- There were no as-builts for the project structures. Comparisons of what the intended elevations were and what they are now are impossible to know.
- The fill dredge pipeline corridor was never at its target elevation, leaving the area continuously flooded and allowing a scour channel to form around the rock plug.
- The buoy system put in place to prevent boaters from motoring over the structures is vandalized continuously.

Monitoring:

- Cost estimates should have included money for surveying.