Coastal Protection and Restoration Authority of Louisiana

State of Louisiana
Coastal Protection and Restoration Authority
Office of Coastal Protection and Restoration

2011 Operations, Maintenance, and Monitoring Report

for

Point Au Fer Island Hydrologic Restoration (TE-22)

State Project Number TE-22
Priority Project List 2

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Operations, Maintenance, and Monitoring Report
For
Point Au Fer Island Hydrologic Restoration
(TE-22)

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Preface

This report includes monitoring data collected through March 2011, and annual Maintenance Inspections through May 2011.

The 2011 report is the 3rd report in a series of reports. For additional information on lessons learned, recommendations and project effectiveness please refer to the 2001 Comprehensive Report and the 2005 Operations, Maintenance, and Monitoring Report on the LDNR web site.

I. Introduction

The Point Au Fer Island Hydrologic Restoration (TE-22) project area is 5,120 acres (2,072 ha) of brackish and saline marshes. The hydrology of the project area marshes have been altered through construction of numerous oil field access and pipeline canals and the disposal of spoil material along their shorelines (spoil banks) (figure 1). Phase I (figure 2) is 3,408 acres (1,379 ha) and Phases II and III (figure 3) are collectively 1,712 acres (693 ha) (Rapp et al. 2001). The project is located on Point Au Fer Island approximately 30 mi (48.3 km) south of Morgan City, Louisiana, in Terrebonne Parish. The project is bound to the northwest and west by Atchafalaya Bay, to the northeast and east 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).

Construction of the Point Au Fer Island Hydrologic Restoration Project was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) enacted on November 29, 1990, as amended. The project was federally sponsored by the National Marine Fisheries Service (NMFS) and locally sponsored by the Louisiana Office of Coastal Protection and Restoration (OCPR).

Approximately 8% of Louisiana's coastal marshes have been converted to open water canals and their associated spoil banks (Neill and Turner 1987). Canal construction likely alters wetland hydrology and contributes to wetland loss in coastal Louisiana (Turner et al. 1984). Similar alterations to the natural drainage pattern at Point Au Fer Island have occurred from the dredging of oil field access canals through the interior of the island. Strong tidal flows occur between Locust Bayou in the southwest and Four League Bay in the northeast (NMFS n.d.). Point au Fer Island has experienced decreased salinities as sediments and fresh water from Atchafalaya Bay have circulated through the islands' interior marshes. Increased freshwater flow and sediment input have not been effectively utilized due to changes in hydrologic patterns and the presence of artificial levees (NMFS n.d.).

The marsh habitat on Point Au Fer Island is predominately brackish marsh with intermediate marsh in the interior of the island. In the years leading up to construction of the project, parts of Point Au Fer Island have become predisposed to saltwater intrusion from the Gulf of Mexico (LDNR/CRD 1998). The Mobil Canal levee (Phase II area) had been breached

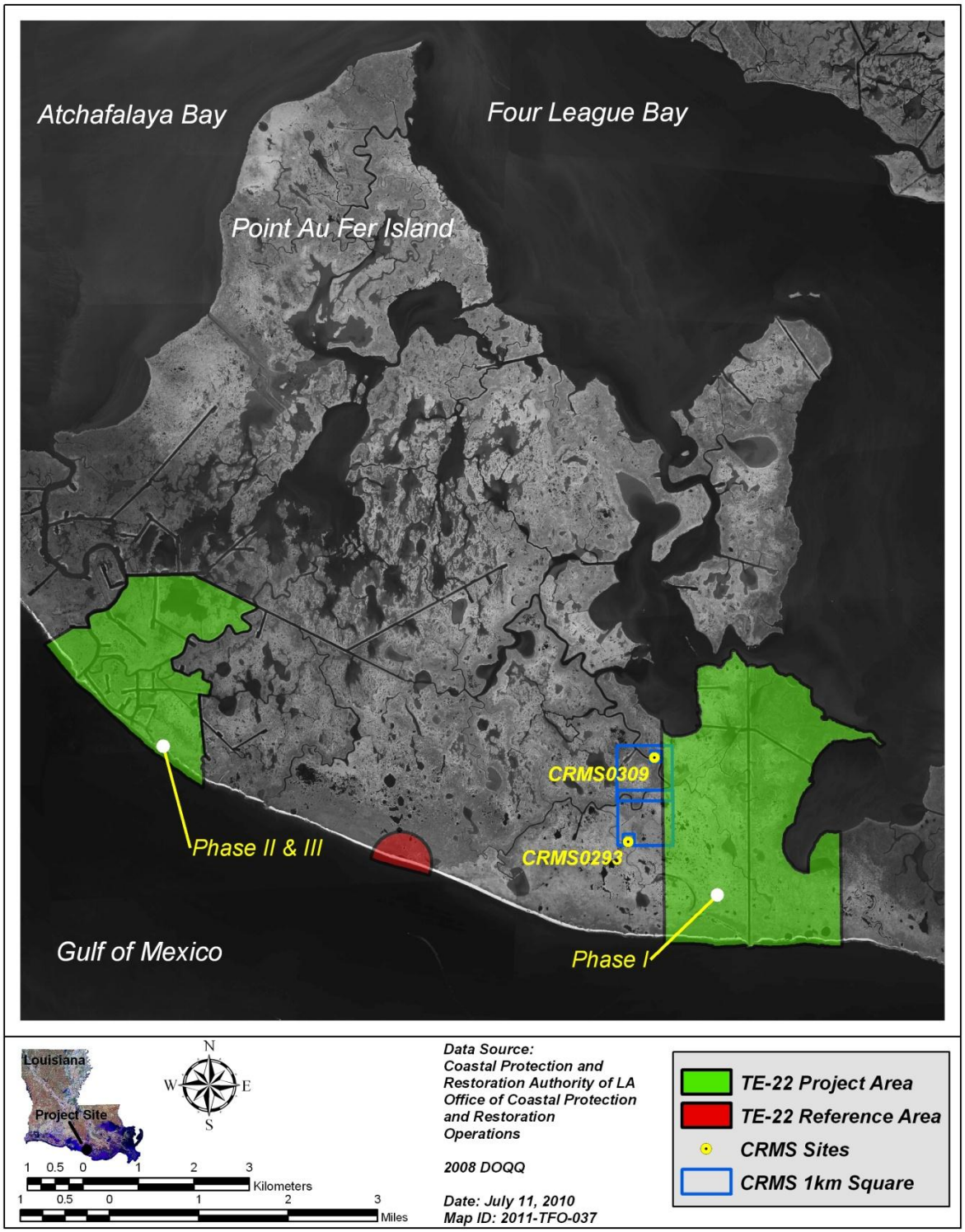

Figure 1. Location of the Point Au Fer Island Hydrologic Restoration (TE-22) project and reference areas.

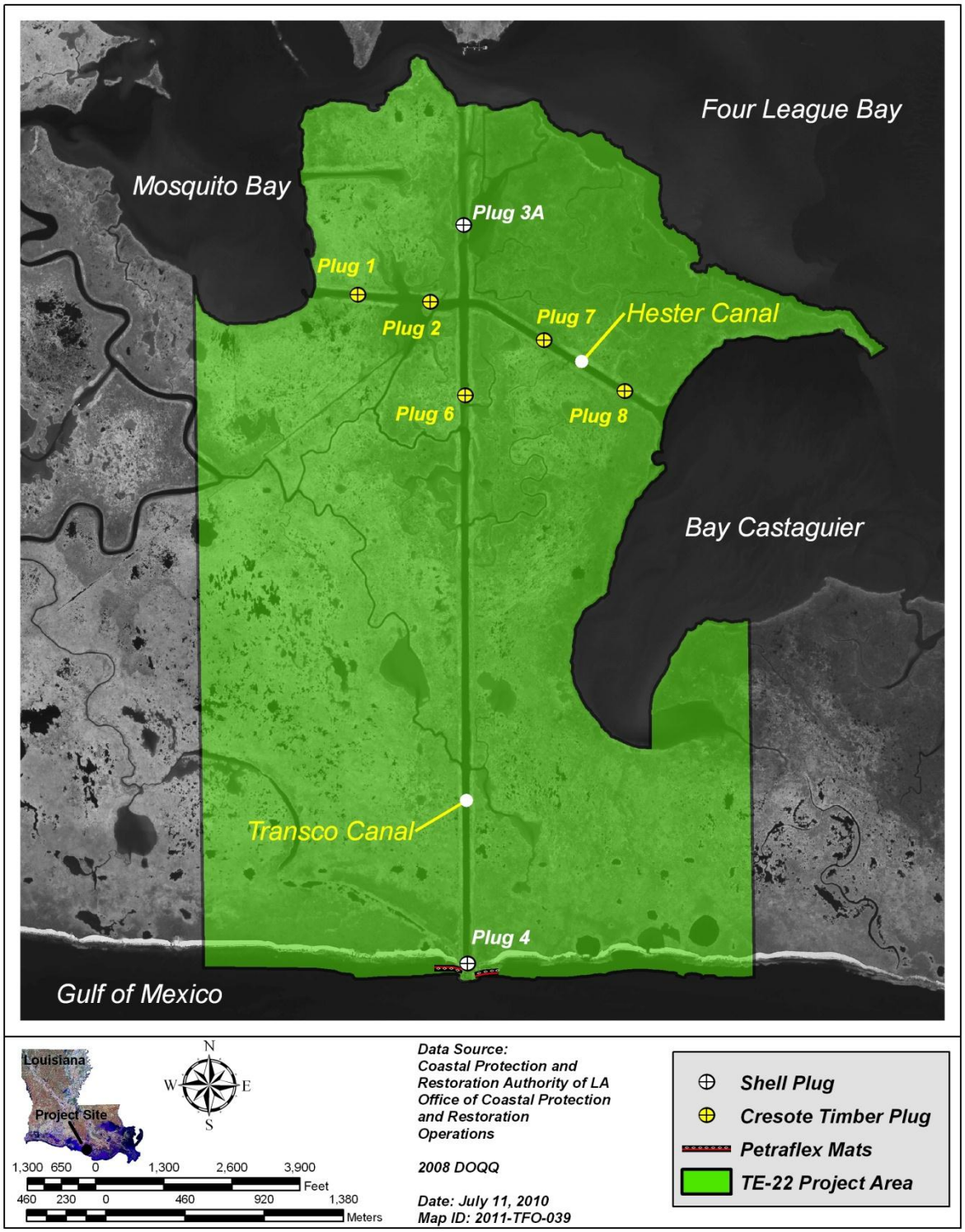

Figure 2. **Location of the Point Au Fer Island Hydrologic Restoration (TE-22) Phase I project features.**

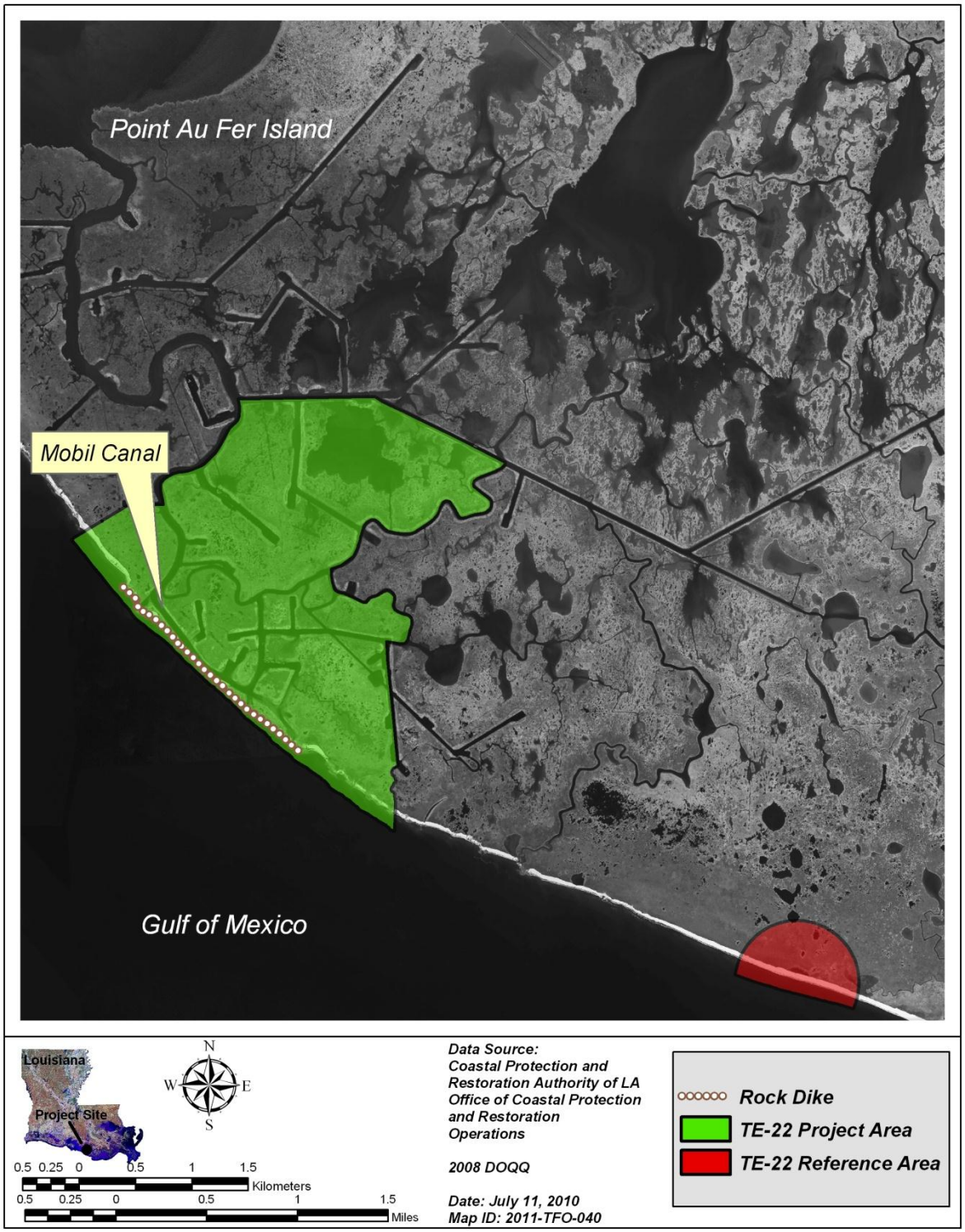

Figure 3. Location of the Point Au Fer Island Hydrologic Restoration (TE-22) Phase II and III project features.

during Hurricane Andrew, and the southern end of Transco Canal (Phase I area) had almost been breached by the Gulf of Mexico.

The project was designed and constructed in order to reduce marsh loss and the potential for saltwater intrusion from storm surges and high tides (Phase I), to restore hydrologic circulation close to conditions present before dredging of oil field access and pipeline canals (Phase I), and to reduce the chance of breaching of the shoreline between the Gulf of Mexico and Mobil Canal during over wash events (Phase II and III). The specific goals established to evaluate the effectiveness of the project were to (1) reduce the rate of marsh loss (Phase I), (2) reduce the rate of canal widening (Phase I), and (3) maintain or decrease local shoreline erosion rate within the project area (Phase II and III).

The Point Au Fer Island Hydrologic Restoration (TE-22) project was constructed in three (3) phases. Phase I consisted of seven (7) canal plugs located in two pipeline canals (figure 2). Four (4) timber plugs, Plugs No. 1, 2, 7, and 8, were constructed in Hester Canal (east-west). One (1) timber plug, Plug No. 6, and two (2) reef shell plugs, Plugs No. 3A and 4, were constructed in Transco Canal (north-south). Construction of the Phase I canal plugs was completed in December 1995. Phase II consisted of approximately 3,600 ft (1,097.3 m) of rock shoreline protection of Areas 1, 2, and 3 along the Gulf of Mexico adjacent to the Mobil Canal (figure 3). Phase II construction was completed in May 1997. Phase III consisted of extending the rock shoreline protection 3,037 ft (925.7 m) to the east (Area 4) and 625 ft (190.5 m) to the west (Area 5). Prior to construction of Phase III, a change order added an additional lift of rock [388 ft (118.3 m)] to compensate for a previous breach area located near the east end of Phase II. Additionally, Plug No. 4 was rebuilt with dredged material, and Petraflex mats [articulated concrete mats, 8 ft x 20 ft x 9 in (2.4 m x 6.1 m x 0.2 m)] were placed along the gulf shoreline to the west and east of the existing Transco Canal steel bulkhead/rock plug (Plug No. 4A) at the gulf. A total of 67 mats were placed on the west side and 58 mats were placed on the east side of Plug No. 4A. Phase III construction was completed in June 2000 (Picciola and Associates, Inc. 2000).

The principle project features include:

Phase I: Construction of timber and shell plugs in Hester and Transco Canals.

- Plug No. 1 – 200 ft (61 m), Timber bulkhead plug in the Hester Canal located near Mosquito Bay.
- Plug No. 2 – 270 ft (82.3 m), Timber bulkhead plug in Hester Canal just west of Transco Canal.
- Plug No. 3A – 240 ft (73.1 m), Reef shell construction located in the Transco Canal north of Hester Canal.
- Plug No. 4 – 225 ft (68.6 m), Reef shell construction located in Transco Canal at the Gulf of Mexico.
- Plug No. 6 – 180 ft (54.9 m), Timber bulkhead plug located in Transco Canal just south of Hester Canal.

- Plug No. 7 – 200 ft (61 m), Timber bulkhead plug located in Hester Canal just east of Transco Canal.
- Plug No. 8 – 180 ft (54.9 m), Timber bulkhead plug located at the east end of Hester Canal near Bay Castagnier.

Phase II: 3,600 FT (1,097.3 m) of rock shoreline protection of the beach separating the Gulf of Mexico from the Mobile Canal.

- Area 1 – 1,800 ft (548.6 m) of rock dike protecting the beach along the Gulf of Mexico separating Mobil Canal and the Gulf.

- Area 2 – 400 ft (122 m) of rock dike protecting the beach along the Gulf of Mexico near the west end of Mobil Canal.

- Area 3 – 1,400 ft (426.7 m) of rock dike along the shoreline of the Gulf between Area 1 and Area 2, constructed with funds provided by Mobil Oil Company.

Phase III: Modifications/additions to the rock shoreline protection of the beach separating the Guft of Mexico from the Mobil Canal.

- Area 4 – 3,037 ft (925.7 m) extension of the Phase II rock structure on the east end.

- Area 5 – 625 ft (190.5 m) extension of the Phase II rock structure on the west end.

- Additional 16-in. (0.4-m) lift of rock placed over 388 ft (188.2 m) of the Phase II rock structure near the east end of Phase II.

- Plug No. 4A (Transco Canal Gulf Bulkhead) – 67 Petraflex Mats placed on west side and 58 mats places on east side of Plug No. 4A.

The Point Au Fer Island Hydrologic Restoration (TE-22) project has a 20-year project life which began in December 1995 (Phase I), May 1997 (Phase II), and June 2000 (Phase III). Two Coast-wide Reference Monitoring System-*Wetlands* (CRMS) sites (CRMS0293 and CRMS0309) were positioned just outside of the Phase I project area after construction on June 24, 2006 and May 25, 2006 (figure 1). These stations will be used to characterize the structure of the brackish marshes on the perimeter of the project area.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Point Au Fer Island Hydrologic Restoration Project (TE-22) is to evaluate the constructed project features in order to identify any deficiencies. The inspection results are used to prepare a report detailing the condition of the project features and recommending any corrective actions considered necessary. Should it be determined that corrective actions are needed, OCPR 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 (O&M Plan, 2002). The annual inspection report also contains a summary of maintenance projects which were completed since completion of constructed project features and an estimated projected budget for the upcoming three (3) years for operation, maintenance, and rehabilitation. The three (3) year projected operation and maintenance budget is shown in Appendix B. A summary of past operation and maintenance projects completed since construction of the Point Au Fer Island Hydrologic Restoration Project is outlined in Section IV.

The annual inspection of the Point Au Fer Island Hydrologic Restoration Project (TE-22) took place on two, separate days. The first trip was held on May 5, 2011 to inspect the Phase II and Phase III rock shoreline protection along the Gulf of Mexico. In attendance were Shane Triche, Elaine Lear, and Adam Ledet from OCPR. The second trip was held on May 11, 2011 to inspect the Phase I canal plugs located on the east side of the island. In attendance were Shane Triche, Brian Babin, and Adam Ledet from OCPR and Joy Merino with National Marine Fisheries Service (NMFS).

The field investigation included a visual inspection of the constructed project features. Photographs taken during the inspection are shown in Appendix A.

b. Inspection Results

Plug No. 1 – Timber Bulkhead Plug (Photos 9-13, Appendix A)
The timber bulkhead Plug No. 1 located on the west end of Hester Canal near Mosquito Bay appeared to be in good overall condition. All structural components are intact with no visible signs of damage. The embankment tie-ins have no signs of erosion or breaching. The warning signs and supports are also in good condition. There are no recommendations for corrective action at this time.

Plug No. 2 – Timber Bulkhead Plug (Photos 14 – 18, Appendix A)
The timber bulkhead Plug No. 2 located just east of Plug No. 1 in Hester Canal appeared to be in good overall condition. All structural components are intact with no visible signs of damage. The embankment tie-ins have no signs of erosion or

breaching. The warning signs and supports are also in good condition. Although the timber bulkhead and its tie-ins have no defects, the structure is considered ineffective due to a large breach (approximately 50 feet) on the south side of the structure which allows tidal flow around Plug No. 2. There are no recommendations for corrective action at this time due to construction access constraints.

Plug No. 3A – Shell Plug (Photos 19 – 21, Appendix A)
The shell Plug No. 3A located in Transco Canal just north of Hester Canal is in poor condition. As previously reported, the shell plug has eroded in the center of the structure leaving the plug crest below water elevation at the time of the inspection. According to the as-built and construction plans, the shell plug was constructed to elevation +4.0 NGVD. The embankment tie-ins are in good condition and have no signs of erosion or breaching. The west warning sign and supports are also in good condition, but the east sign and support is missing. At this time repairing the shell plug is not recommended due to construction access constraints; however, this plug should continue to be monitored on future site visits.

Plug No. 4 – Shell Plug (Photos 32 – 34, Appendix A)
The shell Plug No. 4 is also in poor condition. As previously reported, the structure has been eroded below the waterline for several years. No corrective action is recommended at this time, instead maintenance efforts have been focused on Plug 4A (Transco Canal bulkhead) located at the Gulf of Mexico approximately 200 feet south of Plug No. 4.

Plug No. 4A – Transco Canal Gulf bulkhead (Photos 35 – 48, Appendix A)
The erosion directly behind the mats on the east side of the structure has been slowed or halted since the maintenance rock lift in 2005. Material has been accumulated behind the rock lift and that deposited material is now vegetated. But, shoreline erosion continues to be observed at the east embankment tie-in. On the other end of the structure, the west mats have settled and are over washed during normal tidal events. In addition, due to erosion around the embankment tie-in the mats no longer connect to the shoreline. This allows tidal exchange behind the mats similar to the east end before the 2005 maintenance. At the existing Transco bulkhead, tidal exchange occurs between the Gulf and Transco Canal where water passes behind the bulkhead and over the rocks into the canal. This has been observed in previous inspections but seems to be increasing. The steel sheetpile and tie-rods are heavily corroded and should continue to be monitored.

In 2010 it was recommended to survey the area for comparison to the as-built construction drawings to determine the best course of action to prevent breaching of the Gulf into the Canal. At the time of the inspection and report, this survey is in progress, and is expected to be completed later this summer 2011. Also, preliminary recommendations include a rock lift and dike extension back to the shoreline in the west, and an extension and rock lift on the 2005 extension dike in the east.

Plug No. 6 – Timber Bulkhead Plug (Photos 27-31, Appendix A)
The timber bulkhead Plug No. 6 showed signs of deflection (wavy pattern across canal) shortly after construction. During this annual inspection, the deflection is more apparent that what was observed during the construction. The embankment tie-ins appear intact with no signs of erosion or breaching. There is a separation of the bulkhead (or missing board) near the embankment tie-in on the east side of the structure. This separation has been observed to allow small amounts of water to pass through the bulkhead. The warning signs and supports appear to be in overall good condition. There are no recommendations for corrective actions at this time, but the condition of the structure should continue to be monitored on future site visits.

Plug No. 7 – Timber Bulkhead Plug (Photo 22 – 26, Appendix A)
The timber bulkhead Plug No. 7 located on the east end of Hester Canal just west of Plug No. 8 appeared to be in good overall condition. All structural components are intact with no visible signs of damage. The embankment tie-ins have no signs of erosion or breaching. The warning signs and supports are also in good condition. There are no recommendations for corrective action at this time.

Plug No. 8 – Timber Bulkhead Plug (Photos 1 – 7, Appendix A)
The timber bulkhead and vinyl sheet pile extension are in good condition. There is an existing breach around the southern end of the structure that occurs adjacent to the sheetpile. In addition the Submar scour mats placed on the southern end of the structure are no longer visible. It is assumed that these sections were undermined from the water rushing through the breach and may lie somewhere on the bottom of the breach. The embankment tie-in on the north side of the structure has no signs of erosion or breaching. The warning signs and supports were in good overall condition. There are no recommendations for corrective action at this time, but the structure and breach should be monitored during future inspections for further deterioration.

Phase II – Areas 1, 2 & 3, Rock Dike (Photos 62-64, Appendix A)
As previously reported, several areas of the rock dike appear to be low as well as narrow along the south bank of Mobil Canal. In 2010 it was recommended to survey the area for comparison to the as-built construction drawings to determine the best course of action to prevent breaching of the Gulf into the Canal. At the time of the inspection and report, this survey is in progress, and is expected to be completed later this summer 2011.

Phase III – Area 4, Rock Dike (Photos 53-61, Appendix A)
The rock dike along Area 4 of Phase III appeared to be in good condition with no noticeable settlement of the structure. Beyond the east end of the dike, erosion of the beach has increased and the shoreline has moved further north. As a result, there is some erosion at the end of the dike and now tidal exchange can occur behind the dike. In 2010 it was recommended to survey the area for comparison to the as-built construction drawings to determine the best course of action to prevent breaching of the Gulf into the Canal. At the time of the inspection and report, this survey is in progress, and is expected to be completed later this summer 2011.

Phase III – Area 5, Rock Dike (Photos 49 – 52, Appendix A)
The rock dike along Area 5 of Phase III appeared to be in good condition with no noticeable settlement of the structure. Beyond the west end of the dike, erosion of the beach face has increased and the shoreline has moved inland. Consequently tidal exchange is now occurring behind the mats, and erosion of the shoreline behind the mats was observed. In 2010 it was recommended to survey the area for comparison to the as-built construction drawings to determine the best course of action to prevent breaching of the Gulf into the Canal. At the time of the inspection and report, this survey is in progress, and is expected to be completed later this summer 2011.

c. Maintenance History

Below is a summary of completed maintenance projects and operation tasks performed since completion of the Point Au Fer Island Hydrologic Restoration Project (TE-22).

June 2000 – Phase I Plug No. 4 was rebuilt with dredged material, and Petraflex mats (articulated concrete mats, 8' x 20' x 9") were placed along the shoreline to the west and east of the existing Transco Canal steel bulkhead/rock plug (Plug No. 4A) at the Gulf. A total of 67 mats were placed on the west side and 58 mats were placed on the east side of Plug No. 4A. This work was performed by Johnny F. Smith Truck & Dragline Service, Inc. of Slidell, LA as part of the Phase III construction contract and funded out of the project O&M budget. The total construction cost for this maintenance event was $237,874.

August 2005 – The east end of Phase III (Area 4) rock dike was extended approximately 300 linear feet to the shoreline using LaDOTD Class 250 lbs. riprap on geotextile fabric. At Plug No. 4A (Transco Canal steel bulkhead/rock plug) the east mats were capped with LaDOTD Class 250 lbs. riprap. Also, a rock dike (approximately 200 linear feet of 250 lbs riprap on geotextile fabric) was constructed from the east end of the mats to the shoreline. At Plug No. 8 (Phase I) in Hester Canal, in order to close a breach around the south end, the bulkhead was extended approximately 60 linear feet to the south using vinyl sheet pile bulkhead. Also, three Submar mats (articulated concrete mats, 8' x 20' x 4.5") were placed at the end to prevent scour. It should be noted that a small breach repair to Weir No. 3 of the TE-26 Lake Chapeau project, extending the rock to the south bank, was also included in this maintenance activity. This project was surveyed, designed, and inspected by Picciola & Associates, Inc. of Cut Off, Louisiana. The project was constructed by Luhr Bros., Inc. of Alexandria, LA. The total construction cost for this maintenance event was $391,382.

III. Operations Activity

The constructed features of the Point au Fer Island (TE-22) project do not require operations.

IV. Monitoring Activity

Pursuant to a CWPPRA Task Force decision on August 14, 2003 to adopt the Coastwide Reference Monitoring System-*Wetlands* (CRMS-*Wetlands*) for CWPPRA, updates were made to the Point Au Fer Island Hydrologic Restoration (TE-22) Monitoring Plan to merge it with CRMS-*Wetlands* and provide more useful information for modeling efforts and future project planning while maintaining the monitoring mandates of the Breaux Act. There are two CRMS sites located on the edge of the project area, CRMS0293 and CRMS0309.

a. Monitoring Goals

The project objectives of Phase I are to reduce marsh loss and the potential for saltwater intrusion from storm surges and high tides, and restore hydrologic circulation to conditions present before the dredging of the pipeline canals. In Phases II and III, the objective is to reduce the chance of breaching between the Gulf of Mexico and the Mobil pipeline canal during overwash events, thereby reducing the potential for interior marsh loss.

The specific measurable goals established to evaluate the effectiveness of the project are:

1. Reduce the rate of marsh loss (Phase I).

2. Reduce the rate of canal widening (Phase I).

3. Maintain or decrease local shoreline erosion rate within the project area (Phase II and III).

b. Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

Land/Water Analysis

To delineate land and water environments in the project and reference areas over time, the U.S. Geological Survey's National Wetlands Research Center (USGS/NWRC) in Lafayette, Louisiana obtained 1:24,000 scale near-vertical color-infrared (CIR) aerial photography on December 26, 1994 (preconstruction), November 24, 1997 (as-built), and November 15 and 27, 2000 (post-construction). A subsequent post-construction photograph was captured on October 28, 2008 using a 3.3 ft (1 m) resolution CIR digital image. Although construction was completed in late April 1997, the pre-construction period for land water analyses will be December 26, 1994 to November 24, 1997. All analyses of images taken after November 24, 1997 will be considered

post-construction. Upon completion of the flights, the original photography was checked for flight accuracy, color correctness, cloudiness, and archived at the NWRC. The duplicate photography was indexed, scanned at 300 pixels per square inch, and georectified using ground control data collected with a global positioning system (GPS) with sub-meter accuracy. The individually georectified frames were assembled to produce a mosaic of the project and reference areas.

Using the ERDAS Imagine® geographic information systems (GIS) remote sensing package, each pixel of the photo-mosaic was analyzed and classified to determine land to open water ratios. All areas characterized by emergent vegetation, wetland forest, or scrub-shrub were classified as land, while open water, aquatic beds, and non-vegetated mud flats were classified as water. A percent accuracy of the classification was performed using GIS software by randomly generating 100 points and distributing them throughout the image. Each point was then identified, labeled, and compared to the original classification. The comparisons yielded 90 pixels classified correctly and 10 incorrectly - a 90 percent accuracy level.

A reference area was chosen to provide comparisons of land loss between the rock-armored shoreline of Phases II and III, and a portion of unarmored shoreline east of the project area, in order to determine project effectiveness. The area was chosen based on its proximity to the Phase II and III area, its direct exposure to the wave action and storm events of the Gulf of Mexico, and the lack of future plans to armor the shoreline.

CRMS Supplemental

Additional data collected at CRMS-*Wetlands* stations which can be used as supporting or contextual information for this project. Data types collected at CRMS sites include hydrologic, emergent vegetation, physical soil characteristics, discrete porewater salinity, marsh surface elevation change, vertical accretion, and land/water analysis of 0.4 mi^2 (1.0 km^2) area encompassing the station. For this report, land/water analysis, vegetation data, and hydrologic data from two sites situated just outside the project area (CRMS0293 and CRMS0309) will be used to characterize the structure of the adjacent brackish marshes. In the future, data collected from the CRMS network over a sufficient amount of time to develop valid trends will be used to develop integrated data indices at different spatial scales (local, basin, coastal) to which we can compare project performance.

Land/Water Classification CRMS0293 and CRMS0309

Because of the inclusion of two Coast-wide Reference Monitoring System-*Wetlands* (CRMS) sites (CRMS0293 and CRMS0309) on the perimeter of the Point Au Fer Island Hydrologic Restoration (TE-22) project area (figures 1 and 4), land/water analysis was performed on a 0.4 mi^2 (1.0 km^2) small portion of the project area. The

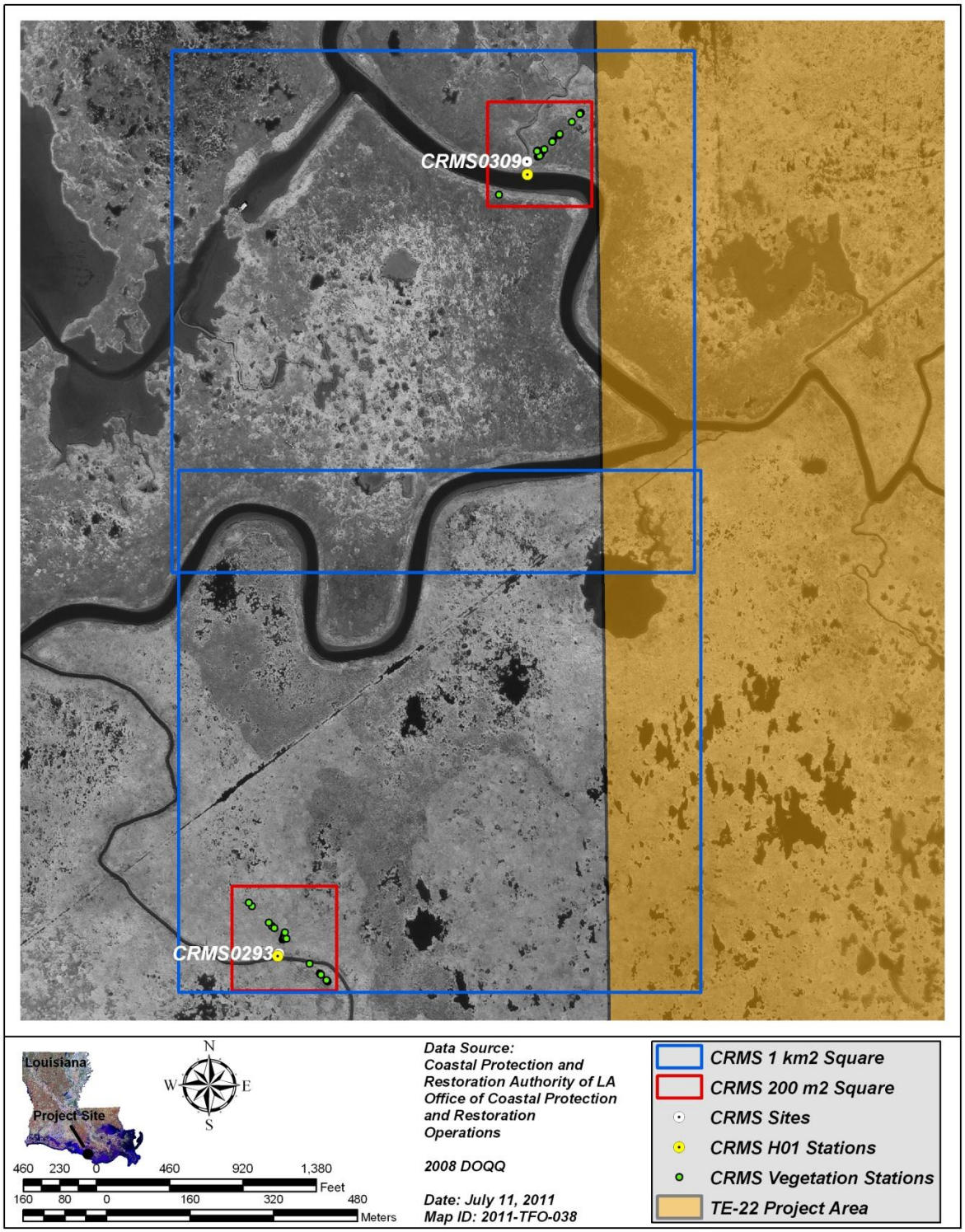

Figure 4. **Location of the CRMS0293 and CRMS0309 sites positioned on the perimeter of the Point Au Fer Island Hydrologic Restoration (TE-22) project area.**

U.S. Geological Survey's National Wetlands Research Center (USGS/NWRC) obtained 3.3 ft (1.0 m) resolution color infrared (CIR) aerial photography to delineate land and water habitats over time. A pre-construction aerial image was captured on November 1, 2005. This image was analyzed, interpreted, processed, and verified for quality and accuracy using protocols established in Folse et al. (2008). Specifically, habitats in the 0.4 mi^2 (1.0 km^2) were condensed to a land or water classification. Land was considered to be a combination of emergent marsh, scrub-shrub, wetland forested, and upland habitats. The open water, beach/bar/flat, and submerged aquatics (SAV) habitat classes were considered water. Once grouped into these two classes, the percentage of land and water and the land to water ratio for the pre-construction period were calculated. After the analysis was complete, the classification data and the photomosaic were mapped to spatially view the data.

Vegetation CRMS0293 and CRMS0309

Because of the inclusion of two Coast-wide Reference Monitoring System-*Wetlands* (CRMS) sites (CRMS0293 and CRMS0309) on the perimeter of the Point Au Fer Island Hydrologic Restoration (TE-22) project area (figures 1 and 4), vegetation data was collected adjacent to the project area. Vegetation stations were established in the CRMS sites to document species composition and percent cover over time. Ten (10) plots were placed inside the 239 yd^2 (200 m^2) square, which is nested within the 0.4 mi^2 (1.0 km^2) square, as per Folse et al. (2008) (figure 4). Vegetation data were collected in August 2006, September 2007, August 2008, July 2009 and June 2010 via the semi-quantitative Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974; Sawyer and Keeler-Wolf 1995; Barbour et al. 1999). Plant species inside each $4m^2$ plot were identified, and cover values were ocularly estimated using Braun-Blanquet units (Mueller-Dombois and Ellenberg 1974) as described in Folse et al. (2008). The cover classes used were: solitary, <1%, 1-5%, 6-25%, 26-50%, 51-75%, and 76-100%. After sampling the plot, the residuals within a 16 ft (5 m) radius were inventoried.

Mean percent cover was calculated to summarize the vegetation data and was grouped by year. Floristic quality index (FQI) was also estimated using the Cretini and Steyer (2011) protocol.

Hydrologic Data CRMS0293 and CRMS0309

Because of the inclusion of two Coast-wide Reference Monitoring System-*Wetlands* (CRMS) sites (CRMS0293 and CRMS0309) on the perimeter of the Point Au Fer Island Hydrologic Restoration (TE-22) project area (figures 1 and 4), hydrologic data is being collected adjacent to the project area. Two continuous recorder stations were installed inside the 200 m^2 (239 yd^2) squares of their CRMS sites using procedures established in Folse et al. (2008). The continuous recorder was adjusted to collect date/time (MM/DD/YYYY, hh:mm:ss) in central standard time (CST), temperature (°C), specific conductance (µS/cm), salinity (ppt), water level (ft), and battery voltage (V) data on an hourly interval. The stations were deployed and serviced, and the data

was processed and verified for quality and accuracy in accordance with the Folse et al. (2008) protocol. The continuous recorder stations were established in May (CRMS0309) and June of 2006 (CRMS0293) and have been under constant operation since that time.

Weekly mean water level and salinity data were calculated to summarize the data collected from these hydrologic monitoring stations during the period from January 2007 to March 2011. Hourly salinity and mean water level observations were averaged producing a daily mean at each site. These daily means were then averaged across weeks to produce a weekly mean for each site. Averaging across days and weeks minimizes the effects of short-term factors (e.g. tidal activity) on the data. Mean weekly salinity and water level were plotted against date for the two stations. Histograms for each station were generated by binning values: bins were created (23 for salinity 20 for elevation), values assigned to a bin and the number of observations in each bin counted. These counts were then divided by the total number of observations to obtain the percent of observations for each bin. For example, at station CRMS0293 a total of 24 weeks (11.21%) had a mean weekly salinity between 7 and 8 ppt and thus were assigned to bin "8".

c. Preliminary Monitoring Results

Land/Water Analysis

The Point Au Fer Island Hydrologic Restoration (TE-22) project and reference areas generally showed declines in subaerial land during the pre- and post-construction periods. However, the Phase I project area showed gains for the 1997-2000 and 1997-2008 intervals. The land/water maps for the December 1994, November 1997, November 2000, and October 2008 are provided in appendix D. The percentage of subaerial land in the Phase I project area was 84% in 1994, 81% in 1997, 84% in 2000 and 81% in 2008 (figure 5). These percentages correspond to land to open water ratios of 1:5 (1994), 1:4 (1997), 1:5 (2000), and 1:4 (2008). From 1994-1997 and 1997-2000, Phase I alternately loss [-40 acres/yr (-16 ha/yr)] and gained [36 acres/yr (15 ha/yr)] subaerial land while the 1994-2000 [-1 acre/yr (-0.5 ha/yr)] and 2000-2008 [-12 acres/yr (-5 ha/yr)] intervals displayed land-loss. The disparities in Phase I land/water rates were probably induced by misinterpretation of the 1997 land/water map because the northern portion of the 1997 land/water analysis does not fit with the other periods. The percentage of subaerial land in the Phase II project area was 66% in 1994, 65% in 1997, 65% in 2000 and 62% in 2008 (figure 5). These percentages correspond to land to open water ratios of 1:2 (1994), 1:2 (1997), 1:2 (2000), and 1:2 (2008). The Phase II project area loss -8 acres/yr (-3 ha/yr) during the pre-construction interval (1994-1997) and -4 acres/yr (-2 ha/yr) during the post-construction interval (1997-2008). The percentage of subaerial land in the reference area was 90% in 1994, 85% in 1997, 85% in 2000 and 74% in 2008 (figure 5). These percentages correspond to land to open water ratios of 1:9 (1994), 1:6 (1997), 1:6 (2000), and 1:3 (2008). The reference

area loss 2 acres/yr (-1 ha/yr) for the pre- (1994-1997) and post-construction (1997-2008) intervals. A considerable quantity of the post-construction land loss was incurred due to erosion along the Gulf of Mexico shoreline. Moreover, these shoreline transgressions were probably induced by the passage of the 2005 (Katrina and Rita) and 2008 (Gustav and Ike) hurricanes.

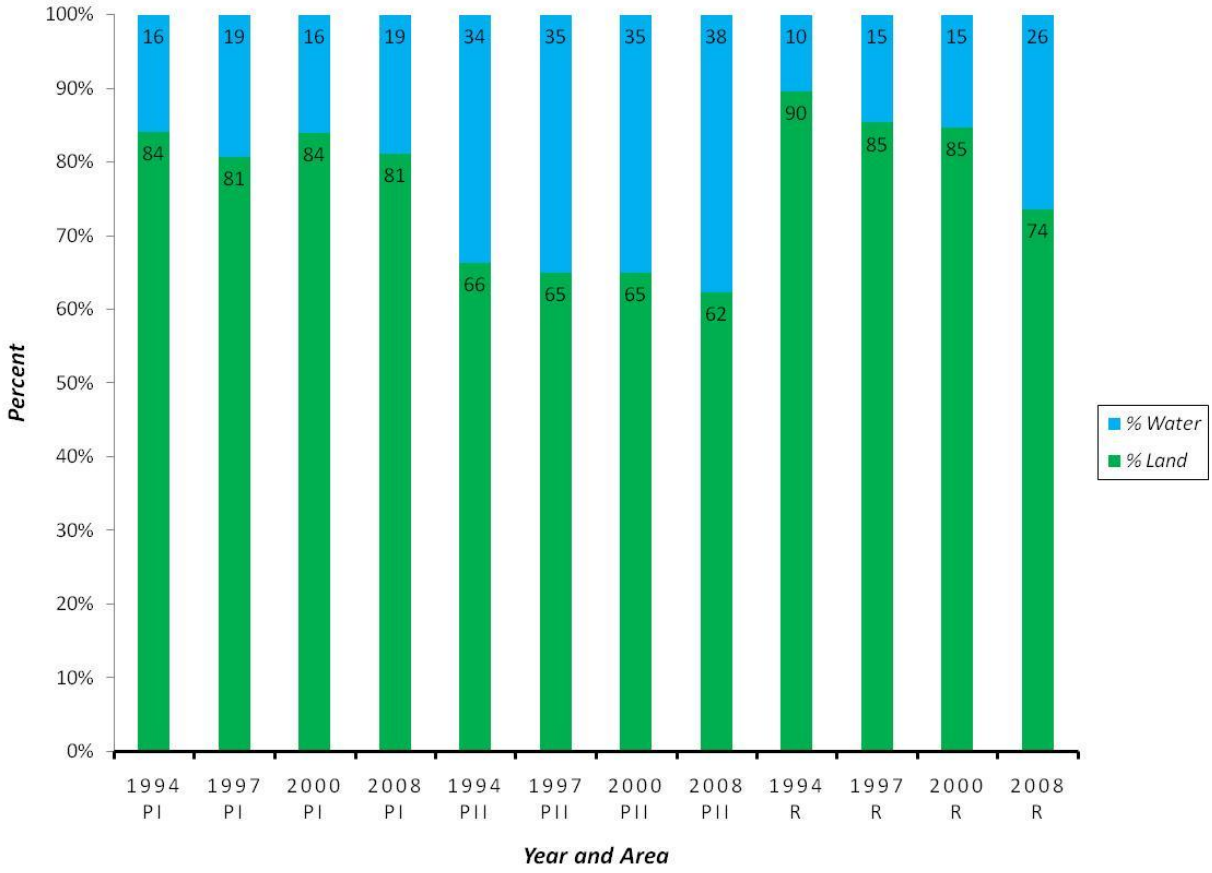

Figure 5. Percentage of land and water inside the Point Au Fer Island Hydrologic Restoration (TE-22) project and references areas in 1994 (pre-construction), 1997 (as-built), 2000 (post-construction), and 2008 (post-construction).

CRMS Supplemental

Land/Water Classification CRMS0293 and CRMS0309

The Land/Water classification of CRMS0293 and CRMS0309 showed that the 0.4 mi^2 (1.0 km^2) square portions of these sites were experiencing minor subaerial land loss from 2005 to 2008. The land/water maps for CRMS0293 in 2005, CRMS0293 in 2008, CRMS0309 in 2005, and CRMS0309 in 2008 are provided in appendix D. The percentage of subaerial land inside the CRMS0293 site were 91% in 2005 and 88% in

2008 while the CRMS0309 percentages were 84% in 2005 and 83% in 2008 (figure 6). These percentages correspond to land to open water ratios of 1:10 (CRMS0293 in 2005), 1:7 (CRMS0293 in 2008), 1:5 (CRMS0309 in 2005), and 1:5 (CRMS0309 in 2008). CRMS0293 subaerial land habitat declined by 7 acres (3 ha) or 2 acres/yr (1 ha/yr) and the CRMS0309 habitat declined by 3 acres (1 ha) or 1 acre/yr (0.4 ha/yr) during this interval. The CRMS0293 site displayed small expansions in ponds throughout the 0.4 mi^2 (1.0 km^2) square. CRMS0309 showed interior marsh loss in the northwestern quadrant of its square. As a result, the marshes adjoining the Point Au Fer Island Hydrologic Restoration (TE-22) Phase I project area exhibited only negligible conversions to water from 2005 to 2008.

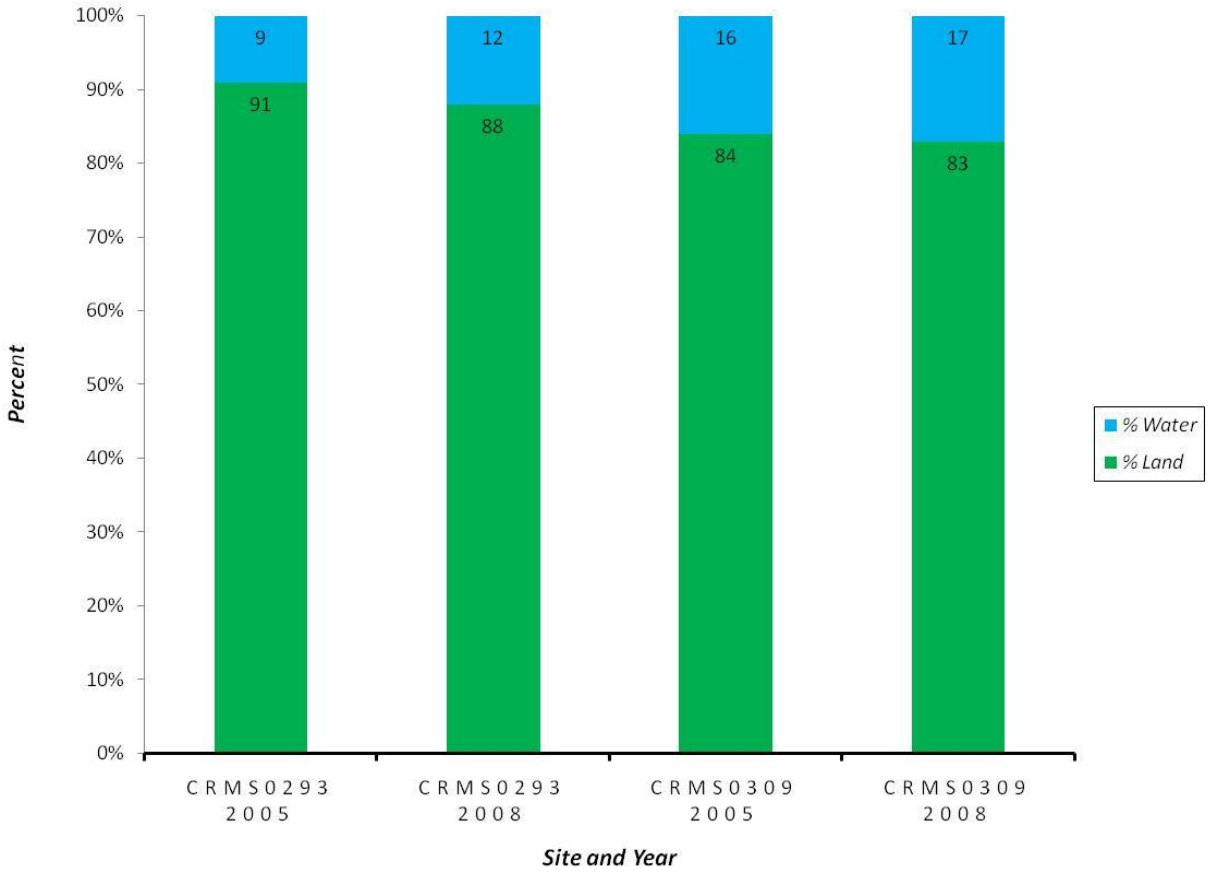

Figure 6. Percentage of land and water inside the CRMS reference areas in 2005 and 2008.

Vegetation CRMS0293 and CRMS0309

The CRMS0293 and CRMS0309 vegetation data confirms the classification of the Point Au Fer Island Hydrologic Restoration (TE-22) project areas as brackish marsh. The dominant species found during all sampling events was *Spartina patens (Ait.) Muhl.* (saltmeadow cordgrass). Other species frequently found at these CRMS sites

were *Distichlis spicata (L.) Greene* (saltgrass), *Schoenoplectus americanus (Pers.) Volk. ex Schinz & R. Keller* (chairmaker's bulrush), *Schoenoplectus robustus (Pursh) M.T. Strong* (sturdy bulrush), and *Fimbristylis castanea (Michx.) Vahl* (marsh fimbry) (figure 7). *S. patens* and *S. americanus* are common inhabitants and indicator species for brackish marsh. The large FIQ and mean cover values consistently measured at CRMS0293 and CRMS0309 (figure 7) signify that these reference areas are structurally and fuctionally brackish marsh habitats. Therefore, a considerable portion of the adjacent Phase I project area and perhaps parts of the Phase II project area are probably composed of mature brackish marshes. In closing, the CRMS0293 and CRMS0309 vegetation data support the assumption that the TE-22 project areas are vigorous brackish marsh habitats.

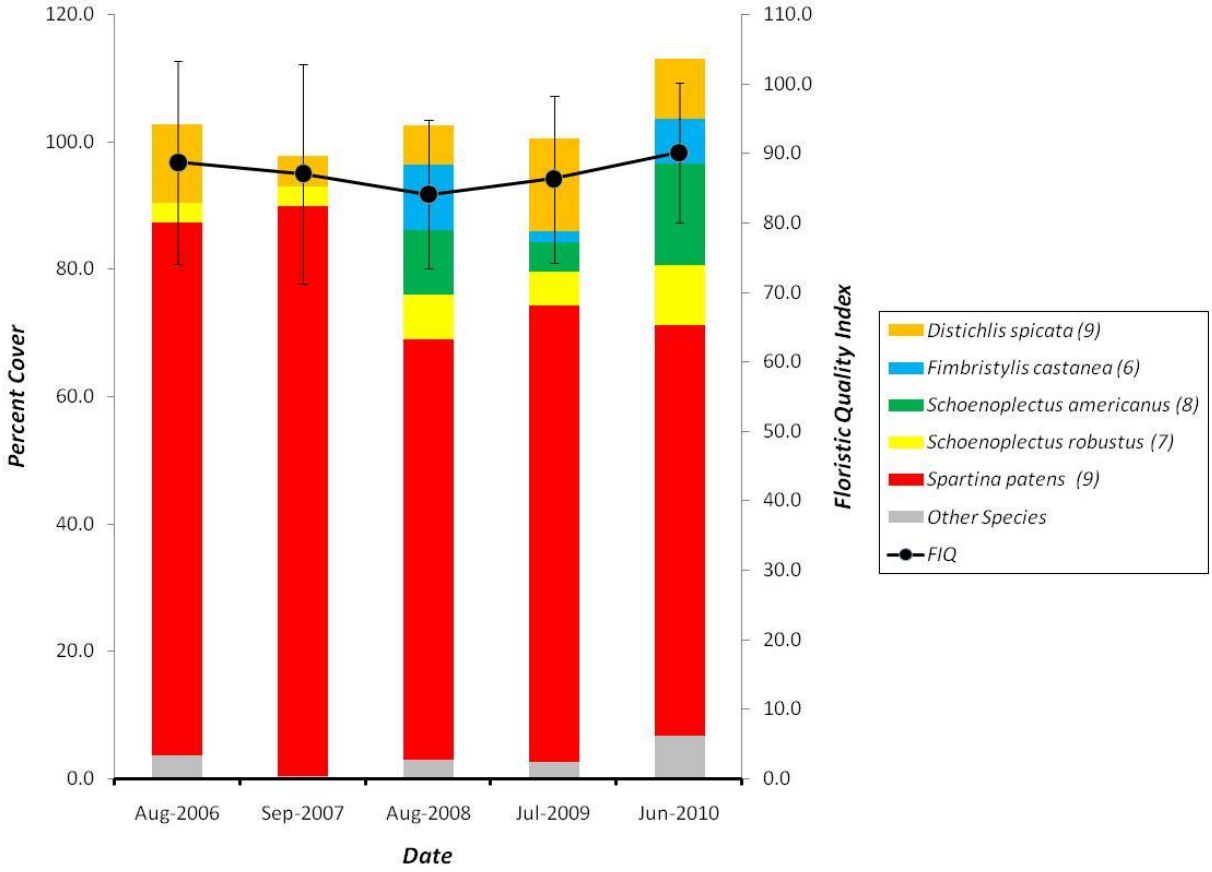

Figure 7. Mean percent cover and floristic quality index for the vegetation species populating CRMS0293 and CRMS0309 reference areas in 2006, 2007, 2008, 2009, and 2010.

Hydrologic Data CRMS0293 and CRMS0309

The CRMS0293 and CRMS0309 hydrologic data confirms the classification of the Point Au Fer Island Hydrologic Restoration (TE-22) project areas as brackish tidal marsh. The mean weekly salinity for the period from January 2007 to March 2011

generally ranged from 4 to 12 ppt (figures 8 and 9). Though the weekly mean salinity did spike above 20 ppt and below 4 ppt, the weekly means infrequently exceeded these thresholds. Because brackish marshes have been classified as having salinities ranging from approximately 5 to 18 ppt (Cowardin et al. 1979), the CRMS0293 and CRMS0309 hydrologic data supports a brackish marsh classification. The weekly mean water levels for the period from January 2007 to March 2011 are outlined in figures 10 and 11. These weekly means generally ranged from 0.6 ft (0.2 m) to 1.2 ft (0.4 m) NAVD 88. The marsh elevations in the vicinity of CRMS0293 and CRMS0309 have been documented as having a 1.42 ft (0.43 m) and 1.30 ft (0.43 m) NAVD 88 elevations. Therefore, flooding in the reference area marshes seem to oscillate with the tidal cycle. However, the project area marshes are probably subject longer duration flooding events due to the presence of spoil banks (Swenson and Turner 1987). The spike in salinity (figure 8) and water level (figure 10) in the summer of 2008 occurred because of the increased hurricane activity during this period. In summary, the CRMS0293 and CRMS0309 hydrologic data endorse the categorization of the TE-22 project areas as tidal brackish marshes.

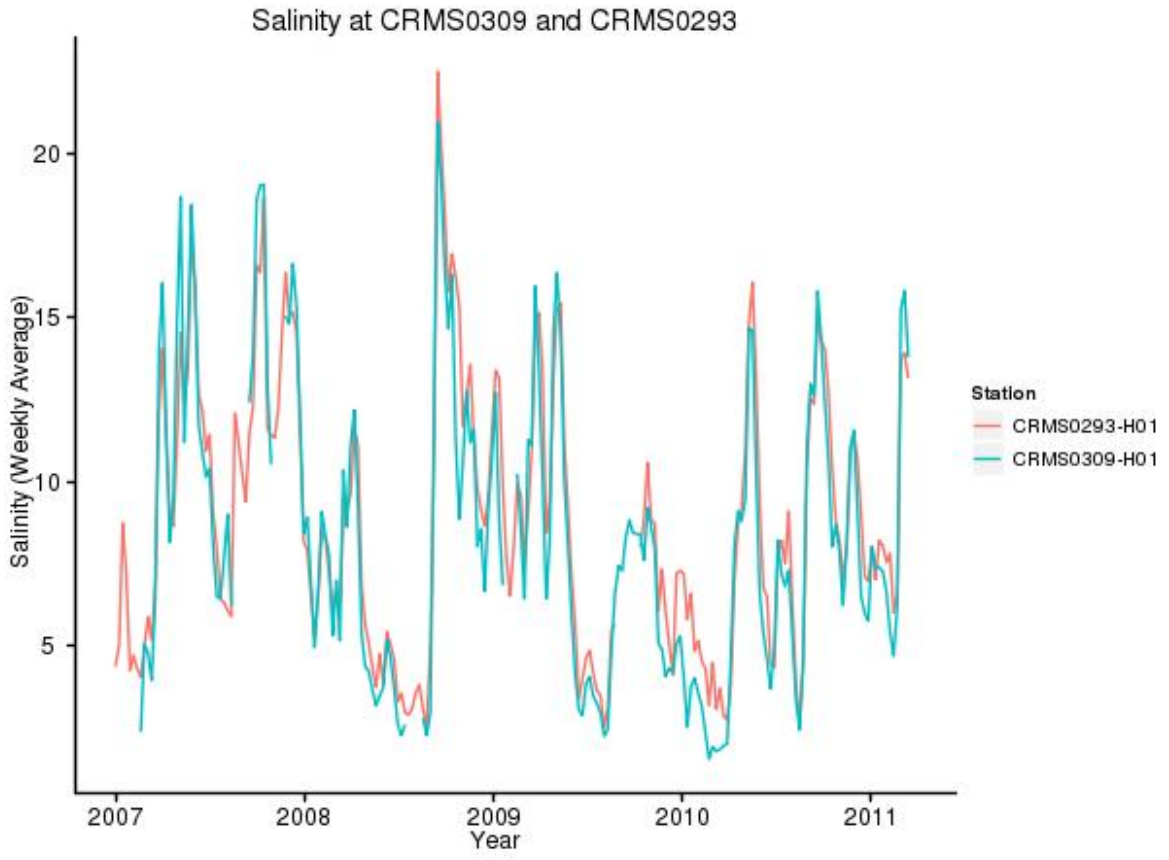

Figure 8. Mean weekly salinity (ppt) inside the CRMS0293 and CRMS0309 sites from 2007 to 2011.

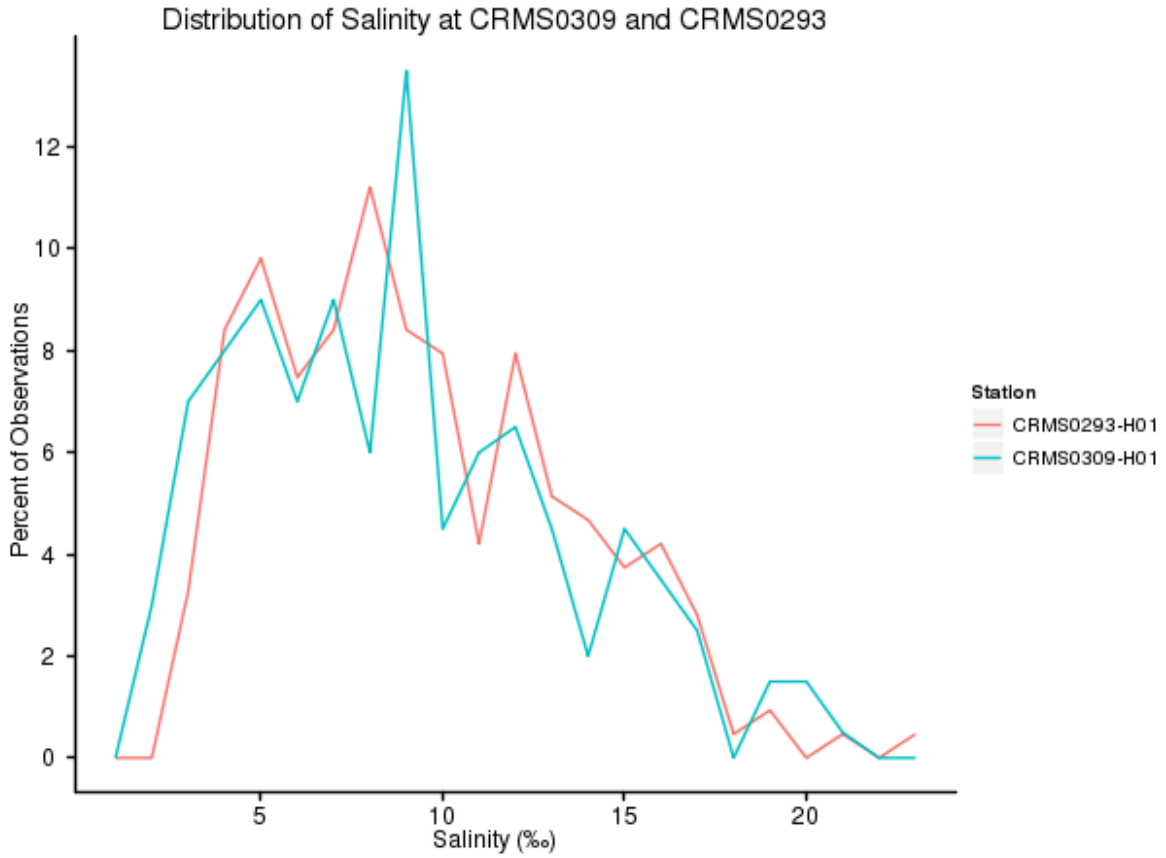

Figure 9. **Frequency distribution of weekly salinities (ppt) for the CRMS0293 and CRMS0309 sites from 2007 to 2011.**

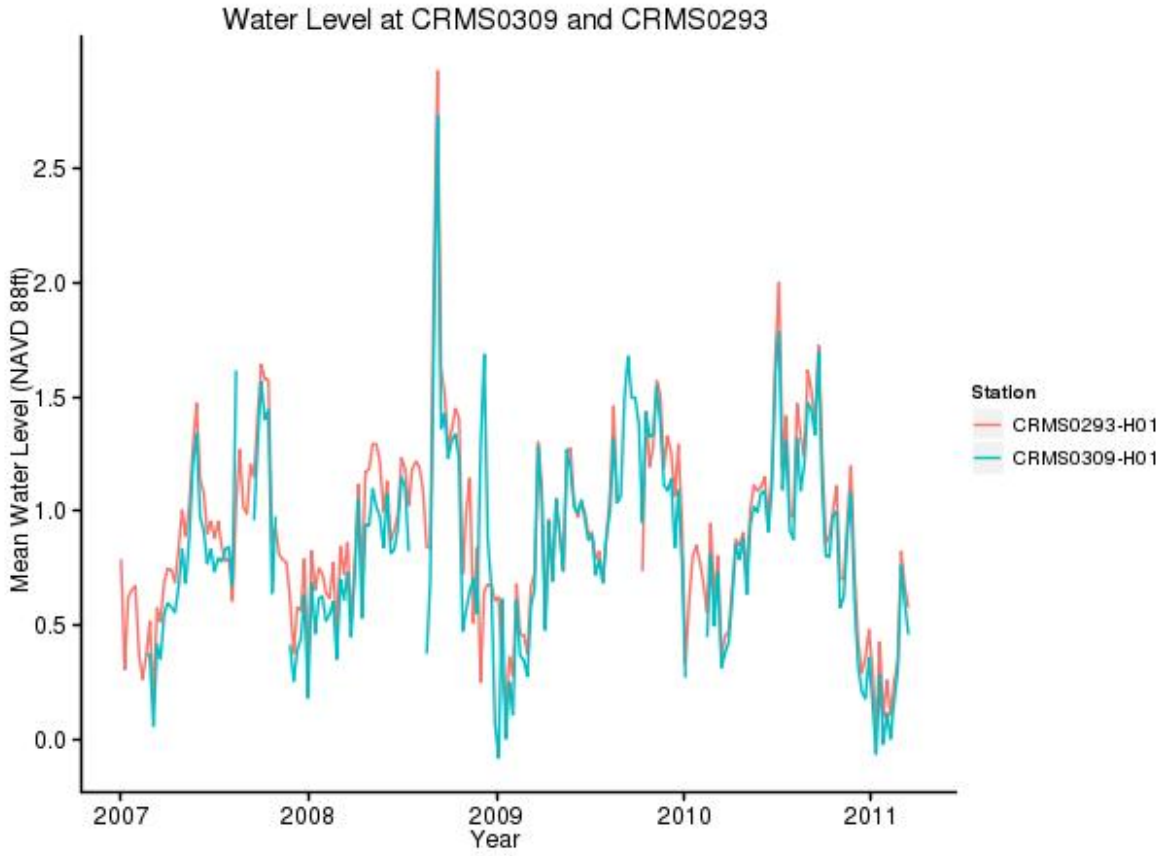

Figure 10. **Mean weekly water level (NAVD 88 ft) inside the CRMS0293 and CRMS0309 sites from 2007 to 2011.**

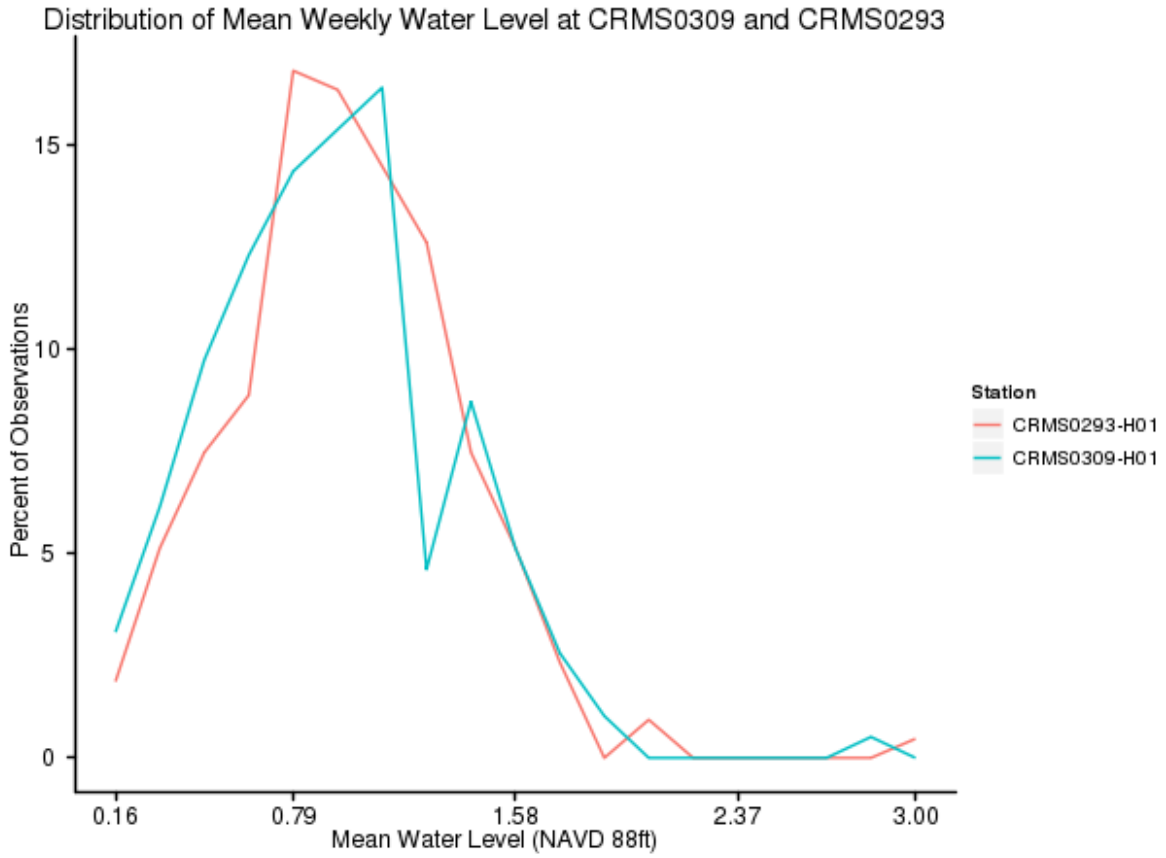

Figure 11. **Frequency distribution of weekly water levels (NAVD 88 ft) for the CRMS0293 and CRMS0309 sites from 2007 to 2011.**

d. Discussion

The results of the Point Au Fer Island Hydrologic Restoration (TE-22) project seem to be relatively inconclusive. However, an attempt will be made to draw conclusions from this data. The Phase I project area land/water analysis alternately showed subareial land loss for the 1994-1997, 1994-2000, and 2000-2008 intervals and gains for the 1997-2000, 1997-2000, and 1997-2008 intervals. Rapp et al. (2001) theorized that the Phase I land/water analysis was in error due to the drought of 2000. However after close examination of the Phase I analysis, it appears that the 1997 image was not accurately interpreted because the northern portion of the 1997 land/water analysis does not fit with the other periods. In addition, the interval from 1997-2008 should have shown land-loss because the Gulf of Mexico and Four League Bay Phase I shorelines transgressed during this period (appendix D). While the 1997 Phase I analysis is in error; the 1994, 2000, and 2008 interpretations appear to be accurate. Consequently, the Phase I 1997 land/water data will be discarded. The 1994-2000 (pre-construction) and 2000-2008 (post-construction) intervals will be utilized to test the performance of the Phase I structures. The 1994, 2000, and 2008 land/water maps show a small amount of interior marsh loss and a high rate of shoreline erosion. The TE-22 Phase II project area and the reference area land/water analysis produced similar results. Moreover, the CRMS reference sites are also in agreement displaying minor interior marsh loss. Though the majority of post-construction land-loss in the Phase I project was derived via shoreline erosion, deciphering the Phase I area interior marsh loss rate from these maps proved difficult. In addition, it was not possible to deduce from land/water analysis whether the low interior marsh loss within the Phase I project area was enhanced by project features (canal plugs) because the interior marsh loss was also minor in other project and reference areas and the pre-construction erosion rate extended beyond project construction. Analysis of hydrological, vegetation, and shoreline (along canals) data would have aided in determining the functioning of these structures and their impact on the interior marshes. The 1994-2000 (pre-construction) Phase I erosion rate of -1 acre/yr (-0.5 ha/yr) was very low. While the 2000-2008 (post-construction) Phase I interior marsh erosion rate also appears to be relatively minor, it was challenging to quantify the amount of interior marsh loss and correlate structure performance with this data. Therefore, it seems that no definitive conclusions could be drawn from this land/water analysis, and the attainment of the goal to reduce the rate of marsh loss in the Phase I project area could not be determined at this time.

The land/water analysis data illustrate that shoreline erosion in the TE-22 project areas and the TE-22 reference area were most pronounced during the period from 2000 to 2008. A substantial acreage of this shoreline erosion was likely caused by the 2005 (Katrina and Rita) and 2008 (Gustav and Ike) hurricanes. Martinez et al. (2009) reported that the Point Au Fer shoreline transgressed by 29.9 ft/yr (9.1 m/yr) from 2004 to 2005 as a result of the 2005 hurricanes. Indeed, this shoreline change rate was considerably higher than the historical rate [17.1 ft/yr (5.2 m/yr)] for Pont Au Fer Island (Martinez et al. 2009). Although the Gulf of Mexico shoreline did not seem to

transgress behind the Phase I petraflex mats or the Phase II rock dike, the shorelines adjacent to these structures did (appendix D and figures 2 and 3). As a result, the goal to maintain or decrease the shoreline erosion rate shoreline within the Phase II and III project areas seems to have been attained to date.

V. Conclusions

a. Project Effectiveness

The results of the Point Au Fer Island Hydrologic Restoration (TE-22) project reveal that one of the project goals was inconclusive while the other goal was realized. The attainment of the first goal to reduce the rate of marsh loss in the Phase I project area could not be determined at this time. Indeed, it was not possible to deduce from land/water analysis whether the low interior marsh loss within the Phase I project area was enhanced by project features (canal plugs) because the interior marsh loss was also minor in other project and reference areas and the pre-construction erosion rate extended beyond project construction. Moreover, it was challenging to quantify the amount of interior marsh loss and correlate structure performance with the land/water data. The second goal to maintain or decrease the shoreline erosion rate shoreline within the Phase II and III project areas seems to have been accomplished to date. This goal was achieved since the Phase II and III rock dike protected the shoreline in its immediate lee while other TE-22 project and reference area shorelines transgressed.

b. Recommended Maintenance Improvements

The Phase I canal plugs are in good overall condition with the aforementioned deficiencies. Shell Plugs No.3A and No. 4 have been eroding in the center of the plugs since the time of construction. No maintenance is recommended for Plug No. 3A due to construction access constraints and no maintenance is recommended for Plug No. 4 due to maintenance efforts being focused on Plug No. 4A. The timber bulkhead Plug No. 6 has been out of alignment since the time of construction, and the deflection appears to be increasing. In addition there is a separation in the bulkhead of Plug No. 6 that is allowing a minor amount water to transfer from one side to the other (See Appendix A, Photo 31). No maintenance is recommended for Plug No. 6 due to the structure being intact. Timber bulkhead Plug No. 8 has been breached along its southern tie-in. The breach should continue to be monitored for any deepening or widening.

At Plug No. 4A (Transco at Gulf) in order to address the continued erosion at the west shoreline tie-in, behind the west mats, and at the east shoreline tie-in, a survey was recommended in the 2010 Annual Inspection Report. At the time of the 2011 inspection and report, this survey is in progress and is expected to be completed later this summer 2011. Based on the results of the survey, maintenance recommendations may include constructing a rock lift on the west mats, closing off the connection

behind those mats with a rock dike extension back to the shoreline, and for the east extending and constructing a rock lift on the 2005 extension dike (See Appendix C).

For the Phase II and III rock dikes, several areas appear to be low. Also, the Gulf shoreline continues to erode where the project rock terminates. This is true of the Phase III Area 4 and Area 5 rock dike. A survey was recommended in the 2010 Annual Inspection Report. At the time of the 2011 inspection and report, this survey is in progress and is expected to be completed later this summer 2011. Based on the results of the survey, maintenance recommendations may include a rock lift along low areas of the dike and extension of the ends back to the shoreline (See Appendix C).

c. Lessons Learned

One monitoring lesson was learned from the Point Au Fer Island Hydrologic Restoration (TE-22) project. The monitoring lesson is that the experimental design of the project was not able to adequately measure the attainment of the first goal, to reduce the Phase I rate of marsh loss. Land/water data alone cannot determine if the Phase I canal plugs and petraflex mats enhanced the rate of interior marsh loss. Analysis of hydrological, vegetation, and shoreline (along canals) data would have aided in determining water movement, vegetation structure, and shoreline position within the Phase I project and reference areas over time. Although the CRMS sites did provide this type of data, there is no project specific data to compare. As a result, there was no mechanism in place to test the effectiveness of the structures in attaining this project goal.

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Appendix A
(Inspection Photographs)

Photo #1: view of timber bulkhead Plug No. 8 from on top of the structure, looking northeast

Photo #2: view of vinyl section on southwest end of Plug No. 8 from on top of the structure, looking southwest

Photo #3: view of pre-existing breach on southwest end of Plug No. 8 from on top of the structure, looking southwest

Photo #4: view of pre-existing breach on southwest end of Plug No. 8 from on top of the structure, looking east

Photo #5: view of timber bulkhead Plug No. 8 northeast end embankment tie-in, looking north

Photo #6: view of timber bulkhead Plug No. 8 from Hester Canal, looking northwest

Photo #7: view of vinyl section on southwest end of Plug No. 8, looking northwest

Photo #8: view of Staff Gauge reading at 11:00 AM on May 10, 2011

Photo #9: view of north side of timber bulkhead Plug No. 1, looking west

Photo #10: view of south side of timber bulkhead Plug No. 1, looking west

Photo #11: view of embankment tie-in on north side of timber bulkhead Plug No. 1, looking west

Photo #12: view of embankment tie-in on south side of timber bulkhead Plug No. 1, looking west

Photo #13: view of warning sign and support of timber bulkhead Plug No. 1, looking west

Photo #14: view of timber bulkhead Plug No. 2 from Hester Canal, looking west

Photo #15: view of timber bulkhead Plug No. 2 from Hester Canal, looking west

Photo #16: view of timber bulkhead Plug No. 2 from Hester Canal, looking west

Photo #17: view of embankment tie-in on the north side of Plug No. 2, looking west

Photo #18: view of embankment tie-in on the south side of Plug No. 2, looking west

Photo #19: view of embankment tie-in on west side of Plug No. 3A, looking north

Photo #20: view of embankment tie-in on east side of Plug No. 3A, looking north

Photo #21: view of shell Plug No. 3A from Transco Canal, looking north

Photo #22: view of southwest end of Plug No. 7 from Hester Canal, looking southeast

Photo #23: view of northeast end of Plug No. 7 from Hester Canal, looking southeast

Photo #24: complete view of Plug No. 7 from Hester Canal, looking southeast

Photo #25: view of embankment tie-in on southwest end of Plug No. 7, looking south

Photo #26: view of embankment tie-in on northeast end of Plug No. 7, looking east

Photo #27: complete view of Plug No. 6 from Transco Canal, looking north

Photo #28: view of Plug No. 6 from Transco Canal, looking north

Photo #29: view of embankment tie-in on east end of Plug No. 6, looking north

Photo #30: view of embankment tie-in on west end of Plug No. 6, looking north

Photo #31: view of separated bulkhead on Plug No. 6, looking north

Photo #32: view of shell Plug No. 4 from Transco Canal, looking south

Photo #33: view of shell Plug No. 4 from Transco Canal, looking south

Photo #34: view of shell Plug No. 4 from Transco Canal, looking south

Photo #35: view of Plug No. 4A just north of existing Transco Pipeline bulkhead, looking southwest

Photo #36: view of Plug No. 4A just north of existing Transco Pipeline bulkhead, looking south

Photo #37: view of Plug No. 4A just north of existing Transco Pipeline bulkhead, looking east

Photo #38: view of Petraflex mats on the west side of Plug No. 4A, looking west

Photo #39: view of Petraflex mats on the west side of Plug No. 4A, looking northwest

Photo #40: view of Petraflex mats on the west side of Plug No. 4A, looking west

Photo #41: view of Petraflex mats on the west side of Plug No. 4A, looking east

Photo #42: view of rock placed on top of Petraflex mats located east of Plug No. 4A, looking east

Photo #43: view of rock placed on top of Petraflex mats located east of Plug No. 4A, looking southeast

Photo #44: view of rock placed on top of Petraflex mats located east of Plug No. 4A, looking south

Photo #45: view of rock placed on top of Petraflex mats located east of Plug No. 4A, looking south

Photo #46: view from east end of Plug No. 4A rock dike, looking east

Photo #47: view from east end of Plug No. 4A rock dike, looking south

Photo #48: view from east end of Plug No. 4A rock dike, looking west

Photo #49: view of the west end of Shoreline Protection Phase III rock wall, looking west

Photo #50: view of the west end of Shoreline Protection Phase III rock wall, looking west

Photo #51: view of Shoreline Protection Phase III rock wall, looking west

Photo #52: view of Shoreline Protection Phase III rock wall, looking east

Photo #53: view of the east end of Shoreline Protection Phase III rock wall, looking east

Photo #54: view of the east end of Shoreline Protection Phase III rock wall, looking north

Photo #55: view of the east end of Shoreline Protection Phase III rock wall, looking south

Photo #56: view of marsh created behind east end of Shoreline Protection Phase III, looking north

Photo #57: view of marsh created behind east end of Shoreline Protection Phase III, looking west

Photo #58: view of marsh created behind east end of Shoreline Protection Phase III, looking east

Photo #59: view of rock dike extension on east side of Shoreline Protection Phase III, looking north

Photo #60: view of tidal channel behind Shoreline Protection Phase III, looking northwest

Photo #61: view of tidal channel behind Shoreline Protection Phase III, looking east

Photo #62: view of Shoreline Protection Phase II rock dike, looking east

Photo #63: view of Shoreline Protection Phase II rock dike, looking west

Photo #64: view of tidal pool behind Shoreline Protection Phase II, looking south

Appendix B
(Three Year Budget Projection)

POINT AU FER ISLAND HYDROLOGIC RESTORATION / TE22 / PPL2

Three-Year Operations & Maintenance Budgets 07/01/2011 - 06/30/2014

Project Manager	O & M Manager	Federal Sponsor	Prepared By
	Triche	*NMFS*	*Triche*

	2011/2012	2012/2013	2013/2014
Maintenance Inspection	$ 6,304.00	$ 6,512.00	$ 6,727.00
Structure Operation	$ -	$ -	$ -
Administration	$ 10,000.00		$ -
NMFS Administration	$ 7,000.00	$ 2,205.00	$ 2,277.00
Maintenance/Rehabilitation			
11/12 Description:	Conduct Rock Lift for Mobil Canal and Transco Canal Bulkhead		
E&D	$ 60,000.00		
Construction	$ 2,150,390.00		
Construction Oversight	$ 80,000.00		
Sub Total - Maint. And Rehab.	$ 2,290,390.00		
12/13 Description			
E&D			
Construction			
Construction Oversight			
	Sub Total - Maint. And Rehab.	$ -	
13/14 Description:			
E&D			$ -
Construction			$ -
Construction Oversight			$ -
		Sub Total - Maint. And Rehab.	$ -

	2011/2012	2012/2013	2013/2014
Total O&M Budgets	**$ 2,313,694.00**	**$ 8,717.00**	**$ 9,004.00**

O&M Budget (3 yr Total)	**$ 2,331,415.00**
Unexpended O&M Funds	**$ 2,334,874.32**
Remaining O&M Budget (Projected)	**$ 3,459.32**

OPERATIONS & MAINTENANCE BUDGET WORKSHEET

Project: **TE-22 Point Au Fer Island Canal Plugs**

FY 11/12 –

Administration (NMFS)	$ 7,000
O&M Inspection & Report	$ 6,304
Surveys – Marsh Creation & Rock Settlement Plates	$ 0
Operation:	$ 0
Maintenance:	$ 2,300,390

Operation and Maintenance Assumptions:
Includes an unplanned maintenance event to cap 7,500 linear feet of rock shoreline protection along the gulf near Mobil Canal, and to cap 450 linear feet of petroflex mats on the western side of the Transco Canal Bulkhead (Structure 4A). Method of construction includes placing a single lift of 440 class DOTD stone on top of the existing rock and petroflex mats.

Construction Cost:	Mobilization and Demobilization:	$ 200,000
	Rock Rip Rap (25,000 Tons @ $70/ton)	$ 1,750,000
	Geotextile Fabric (700 Yards @ $7.00/ yd)	$ 4,900
	Sub-Total Construction:	$ 1,954,900
	10% contingency:	$ 195,490
	Total Estimated Construction Cost:	**$ 2,150,390**

Engineering and Design:	$ 50,000
Surveying	$ 10,000
Construction Oversight:	$ 80,000
LDNR Construction Administration:	$ 10,000

Overall Project Budget for Rock Shoreline Refurbishment: **$ 2,300,390**

O&M Inspection and Report – Annual Inspection Field Trip Rate for 1-day trip with NMFS of $4,691 (2002 price level) and annual inflation rate of 2.7% through 2007 and 3.3% for 2008 and beyond taken from PPL12 Project Cost Summary compiled by NRCS dated 8/6/2002.

FY 12/13 –

Administration (NMFS)	$ 2,205
O&M Inspection & Report	$ 6,512
Surveys – Marsh Creation & Rock Settlement Plates	$ 0
Operation:	$ 0
Maintenance:	$ 0

Operation and Maintenance Assumptions:
O&M Inspection and Report – Annual Inspection Field Trip Rate for 1-day trip with NMFS of $4,691 (2002 price level) and annual inflation rate of 2.7% through 2007 and 3.3% for 2008 and beyond taken from PPL12 Project Cost Summary compiled by NRCS dated 8/6/2002.

FY 13/14 –

Administration (NMFS)	$	2,277
O&M Inspection & Report	$	6,727
Surveys – Marsh Creation & Rock Settlement Plates	$	0
Operation:	$	0
Maintenance:	$	0

Operation and Maintenance Assumptions:
O&M Inspection and Report – Annual Inspection Field Trip Rate for 1-day trip with NMFS of $4,691 (2002 price level) and annual inflation rate of 2.7% through 2007 and 3.3% for 2008 and beyond taken from PPL12 Project Cost Summary compiled by NRCS dated 8/6/2002.

2012-2014 Accounting

Total Expenditures (Lana Report)	$ 744,614.00
OCPR Expenditures	$ 3,485.68
Total Expenditures	$ 748,099.68
Current O&M Budget (less COE administration)	$3,082,974.00
Unexpended O&M Funds	**$2,334,874.32**

Point Au Fer Island Hydrologic Restoration (TE-22)
Federal Sponsor: NMFS
Construction Completed : May 1999
PPL 2

Previous O&M Funding Requests	Baseline Approved Funding	2004	2005	2009	2010 ??	Currently Funded
State O&M	$449,429	$215,000	$165,000	$2,238,280		$3,067,709
Corps Admin	$0			$3,722	$1,278	$5,000
Federal S&A	$0			$13,060	$2,205	$15,265
Total	$449,429	$215,000	$165,000	$2,255,062	$3,483	$3,087,974

Current Approved O&M Budget June 2009	Year 0 FY98	Year - 1 FY99	Year -2 FY00	Year -3 FY01	Year -4 FY02	Year -5 FY03	Year -6 FY04	Year -7 FY05	Year -8 FY06	Year -9 FY07	Year -10 FY08	Year -11 FY09	Year -12 FY10	Year -13 FY11	Year -14 FY12	Year -15 FY13	Year -16 FY14	Year -17 FY15	Year -18 FY16	Year -19 FY17	Project Life Budget	Currently Funded
State O&M												$737,004	$17,908	$6,103	$2,306,694	$6,512	$6,727	$6,949	$7,178	$7,415	$3,102,490	$3,067,709
Corps Admin													$1,225	$1,240	$1,257	$1,278	$1,301	$1,325	$1,349	$2,288	$11,263	$5,000
Federal S&A													$4,000	$2,060	$7,000	$2,205	$2,277	$2,353	$2,430	$2,510	$24,835	$15,265
Total																					$3,138,588	$3,087,974

Projected O&M Expenditures																				Remaining Project Life	Current 3 year Request
Maintenance Inspection															$6,304	$6,512	$6,727	$6,949	$7,178	$7,415	$41,085	$19,543
Structure Operation																					$0	$0
																					$0	$0
Federal S&A															$7,000	$2,205	$2,277	$2,353	$2,430	$2,510	$18,775	$11,482
Construction Administration																					$0	$0
OCPR Administration															$10,000						$10,000	$10,000
Maintenance/Rehabilitation																					$0	$0
E&D															$60,000						$60,000	$60,000
Construction															$2,150,390						$2,150,390	$2,150,390
Construction Oversight															$80,000						$80,000	$80,000
Total				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,313,694	$8,717	$9,004	$9,302	$9,608	$9,925	$2,360,250	$2,331,415

O&M Expenditures from COE Report	$744,614
State O&M Expenditures not submitted for in-kind credit	$3,486
Federal Sponsor MIPRs (if applicable)	$0
Total Estimated O&M Expenditures (as of April 2010)	$748,100

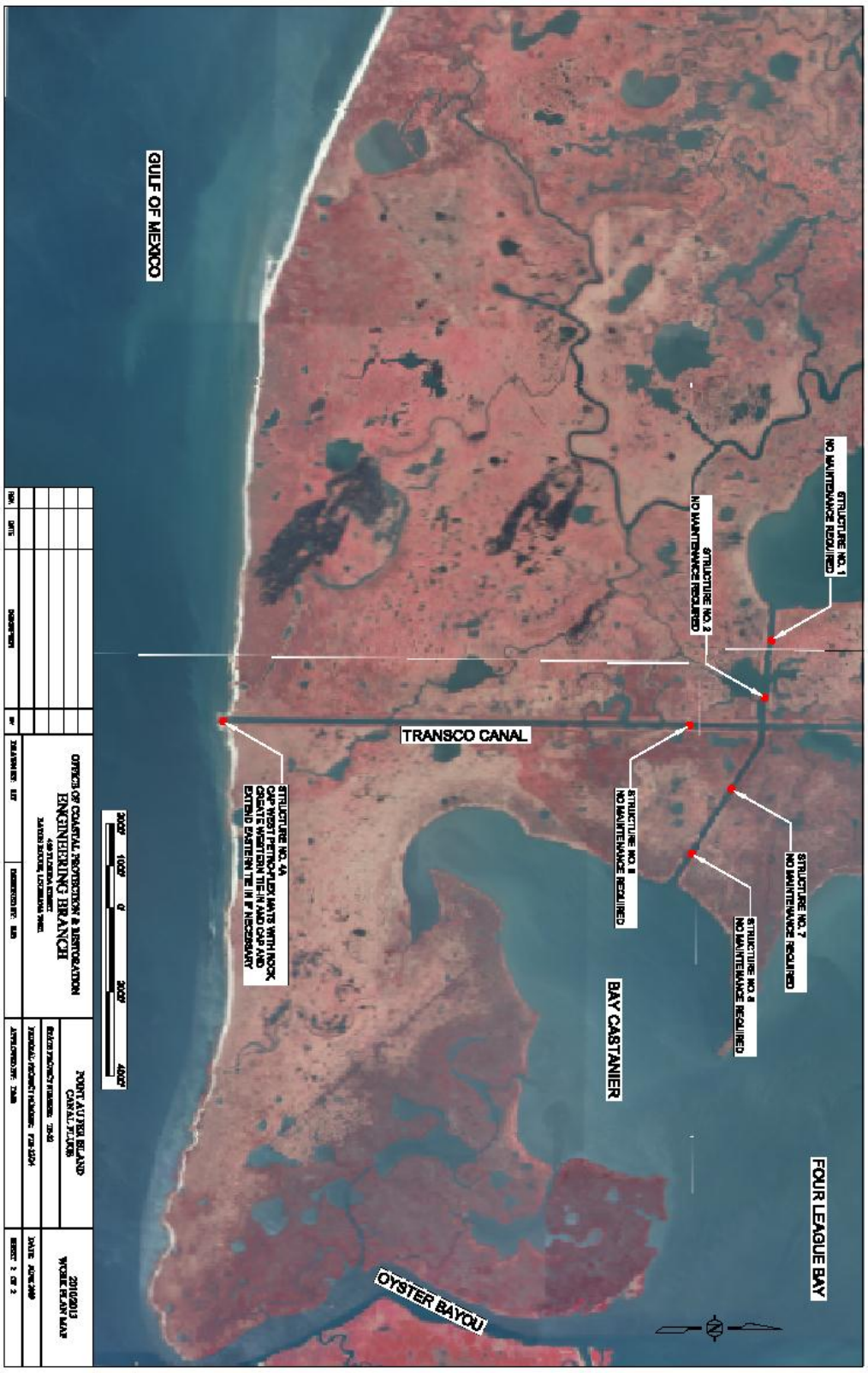
Current O&M Budget less COE Admin	$3,082,974
Remaining Available O&M Budget	$2,334,874
Incremental Funding Request Amount FY12-FY14	**-$3,459**

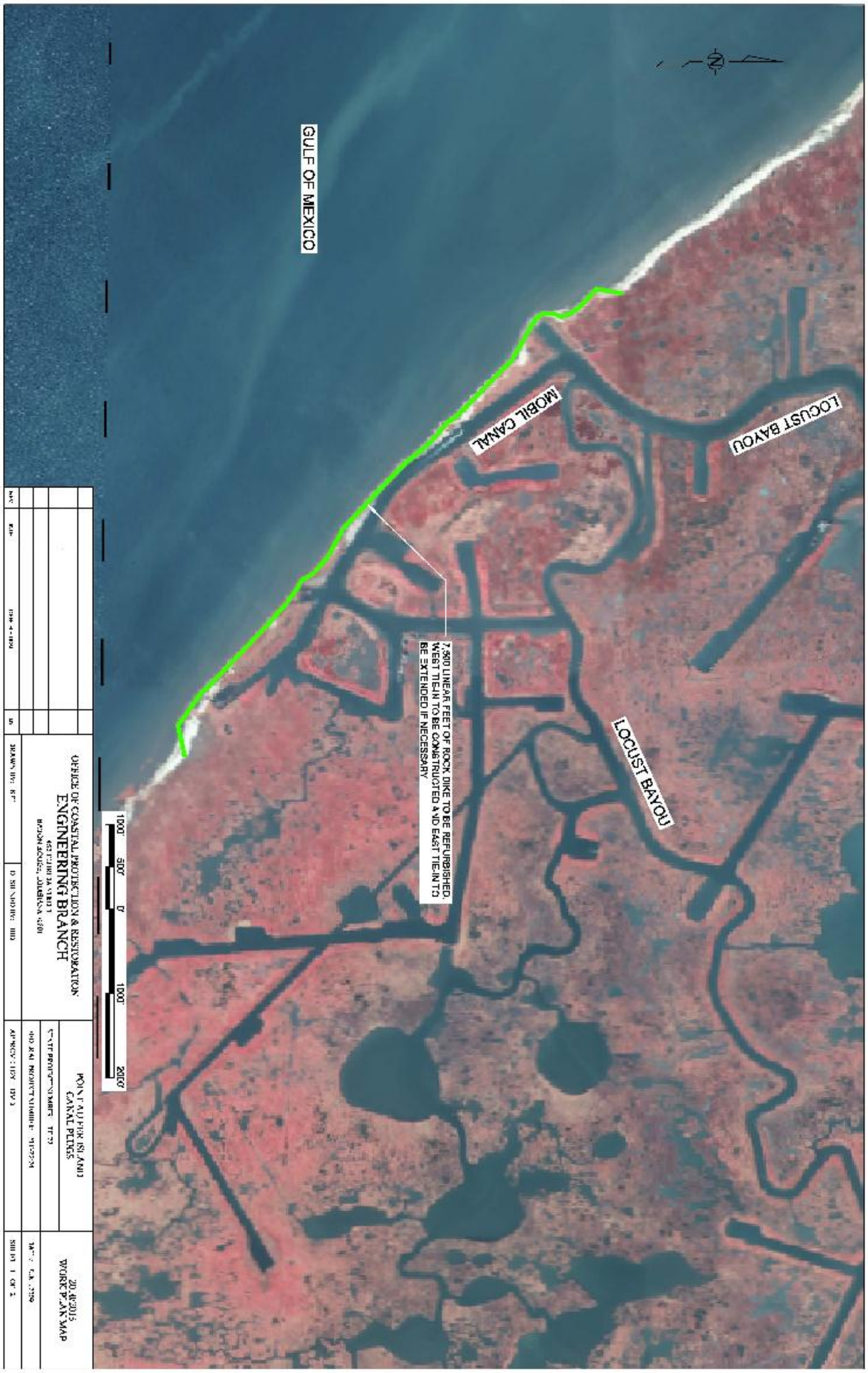
Current Project Life Budget less COE Admin	$3,127,325
Total Projected Project Life Budget	$3,108,350
Project Life Budget Request Amount	**-$18,975**

Notes:

1. The year-by-year figures for the current Approved O&M Budget are based on the BEAST approved at the 10/28/09 Task Force meeting.

Appendix C
(Work Plan Maps)


GULF OF MEXICO
TRANSCO CANAL
BAY CASTANIER
FOUR LEAGUE BAY
OYSTER BAYOU
STRUCTURE NO. 1
NO MAINTENANCE REQUIRED
STRUCTURE NO. 2
NO MAINTENANCE REQUIRED
STRUCTURE NO. 3
NO MAINTENANCE REQUIRED
STRUCTURE NO. 4
NO MAINTENANCE REQUIRED
STRUCTURE NO. 7
NO MAINTENANCE REQUIRED
STRUCTURE NO. 4A
CAP WEST PETRO-FLEX MATS WITH ROCK
CREATE WESTERN TIE-IN AND CAP AND
EXTEND EASTERN TIE IN IF NECESSARY
3000' 1000' 0 2000' 4000'
OFFICE OF COASTAL PROTECTION & RESTORATION
ENGINEERING BRANCH
POINT AU FER ISLAND
CANAL FLUMES
2010/2013
WORK PLAN MAP
DATE: JUNE 2009
SHEET 1 OF 2


GULF OF MEXICO
MOBIL CANAL
LOCUST BAYOU
LOCUST BAYOU
7,500 LINEAR FEET OF ROCK DIKE TO BE REFURBISHED. WEST TIE-IN TO BE CONSTRUCTED AND EAST TIE-IN TO BE EXTENDED IF NECESSARY
1000'
500'
0'
1000'
2000'
OFFICE OF COASTAL PROTECTION & RESTORATION
ENGINEERING BRANCH
POINT AU FER ISLAND
CANAL PLUGS
WORK PLAN MAP

Appendix D
(Land/Water Maps)

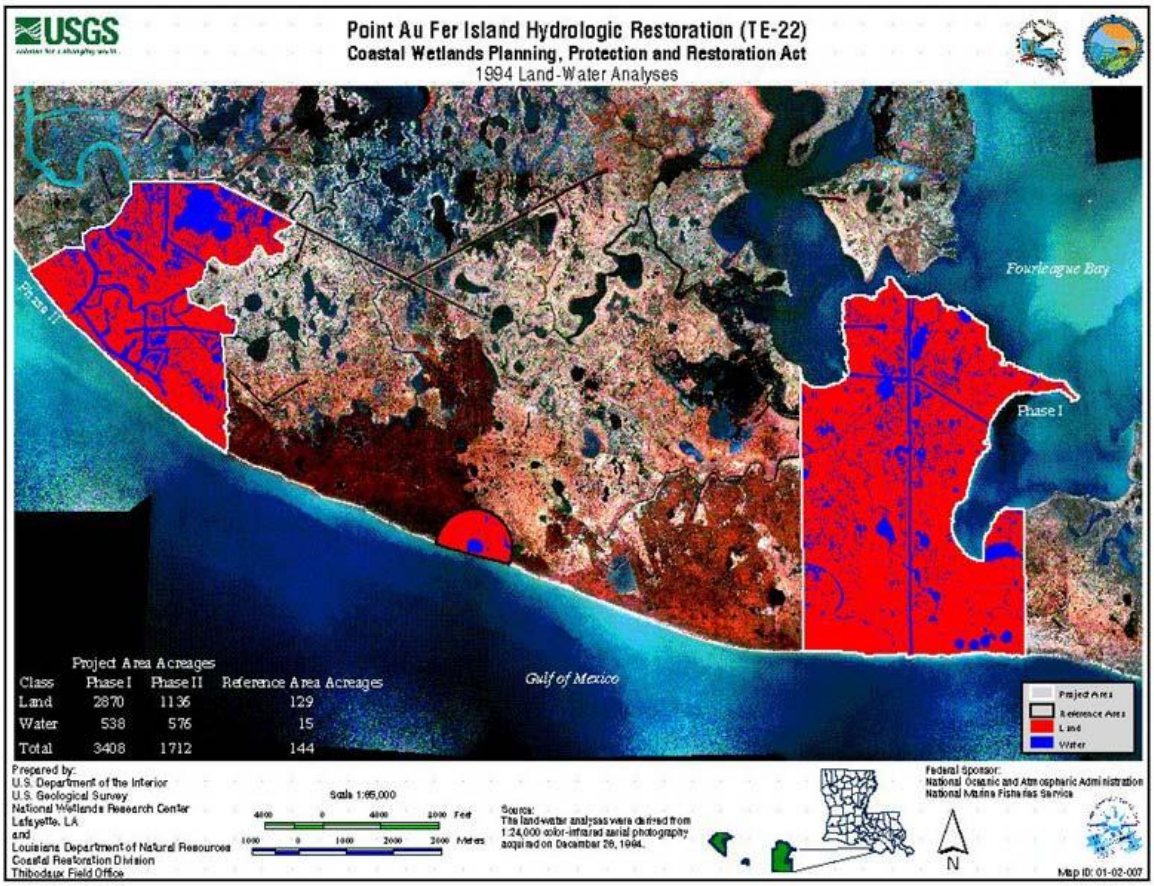


Figure . **Pre-construction (1994) land/water analysis of the Point Au Fer Island Hydrologic Restoration (TE-22) project and reference areas.**

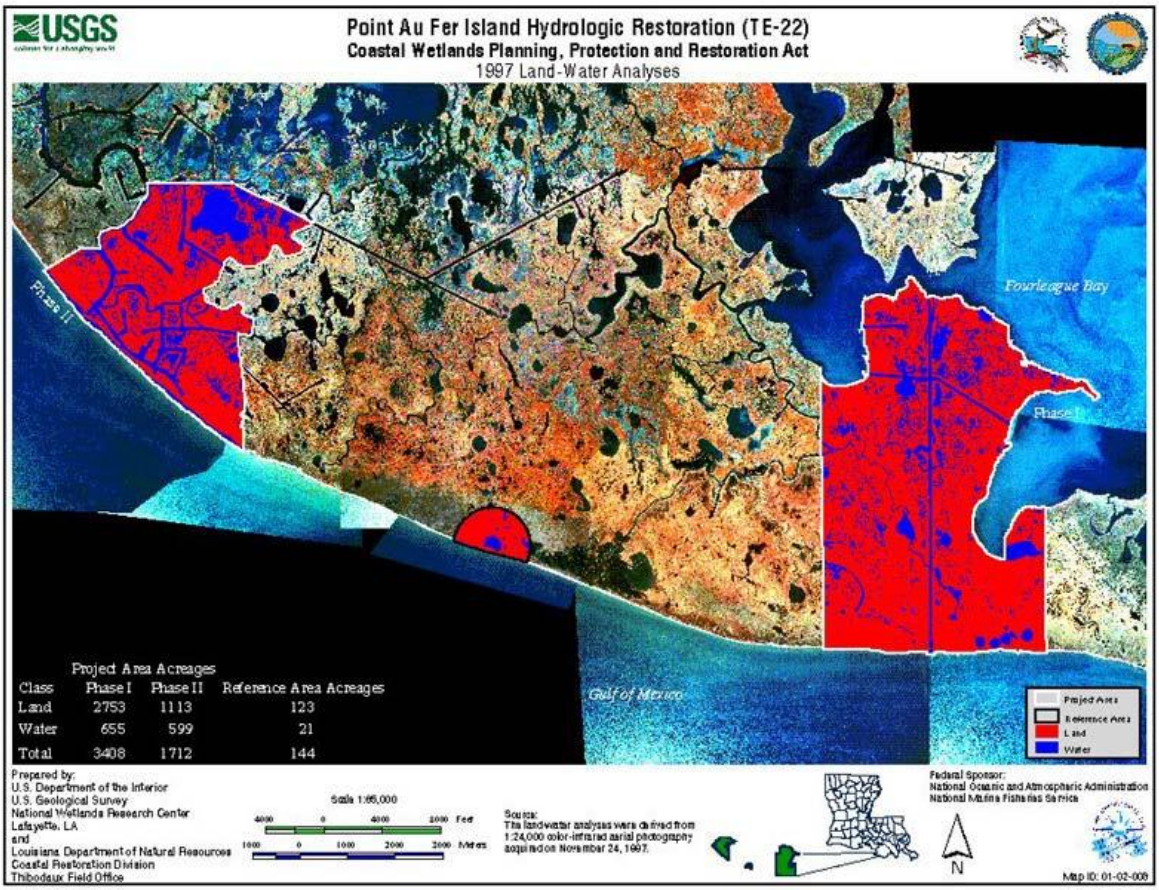


Figure . **As-built (1997) land/water analysis of the Point Au Fer Island Hydrologic Restoration (TE-22) project and reference areas.**

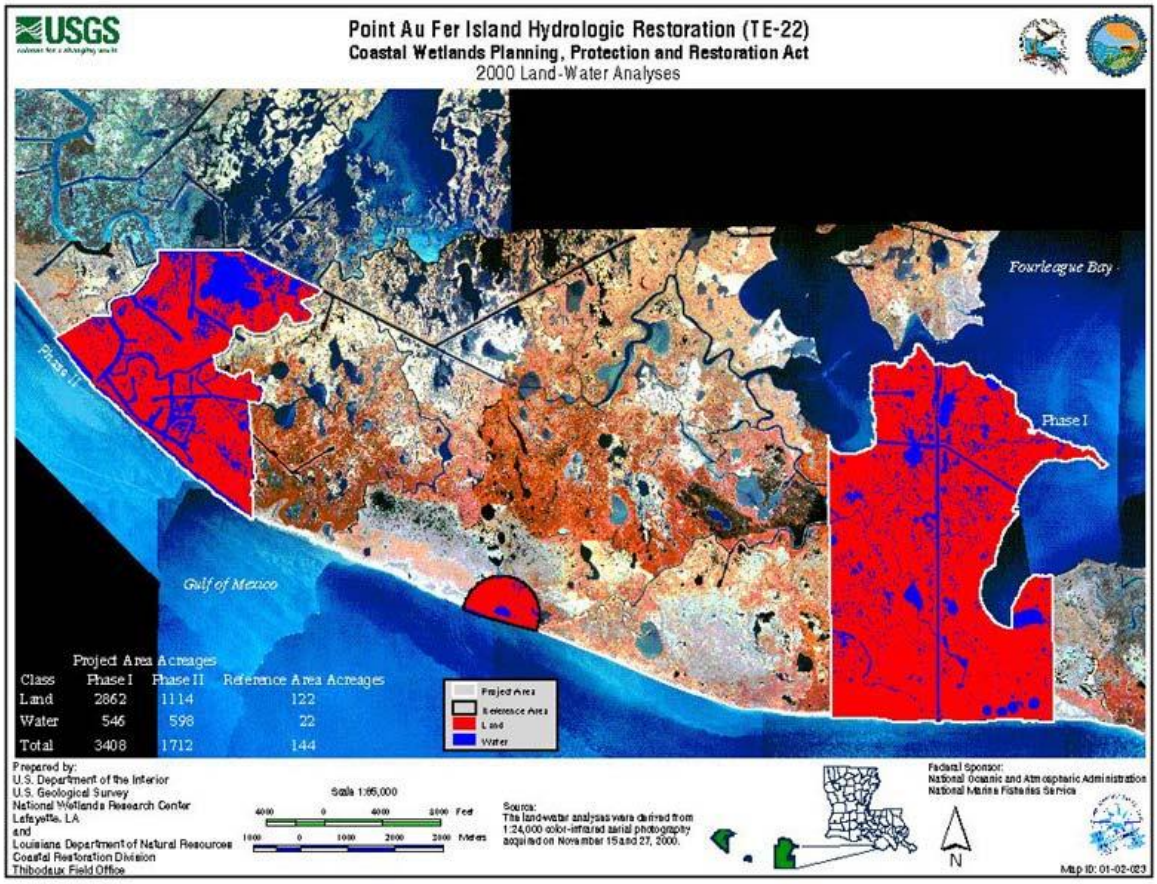


Figure . **Post-construction (2000) land/water analysis of the Point Au Fer Island Hydrologic Restoration (TE-22) project and reference areas.**

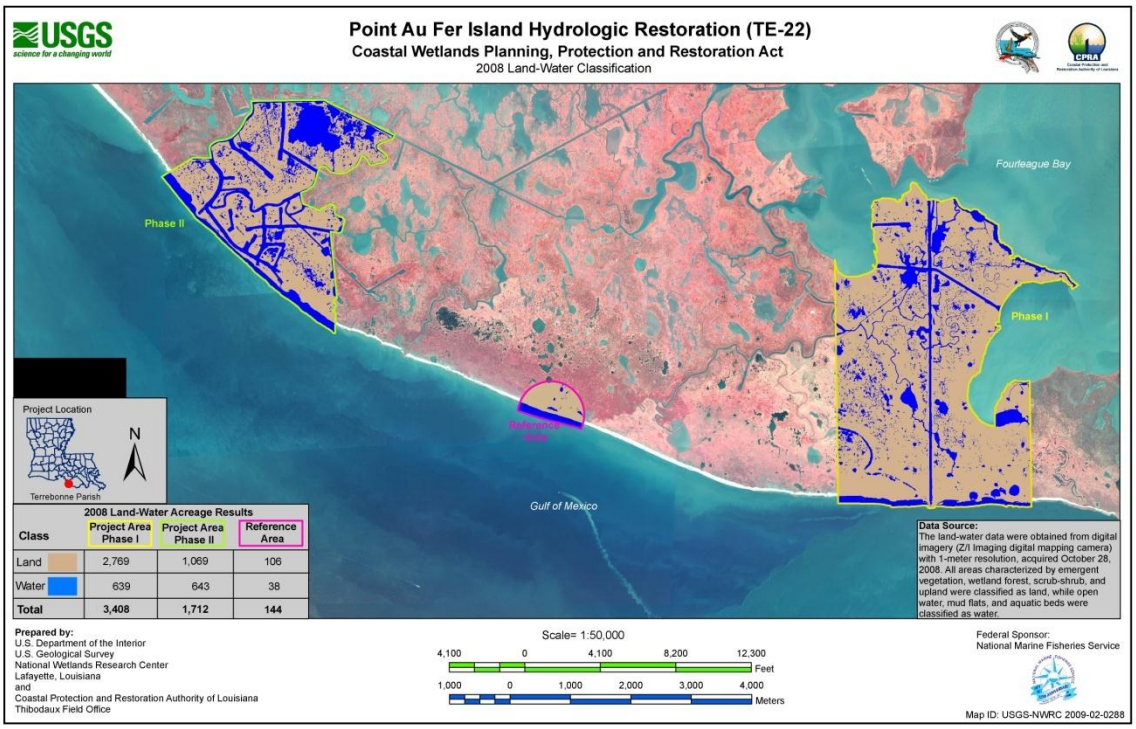


Figure . **Post-construction (2008) land/water analysis of the Point Au Fer Island Hydrologic Restoration (TE-22) project and reference areas.**

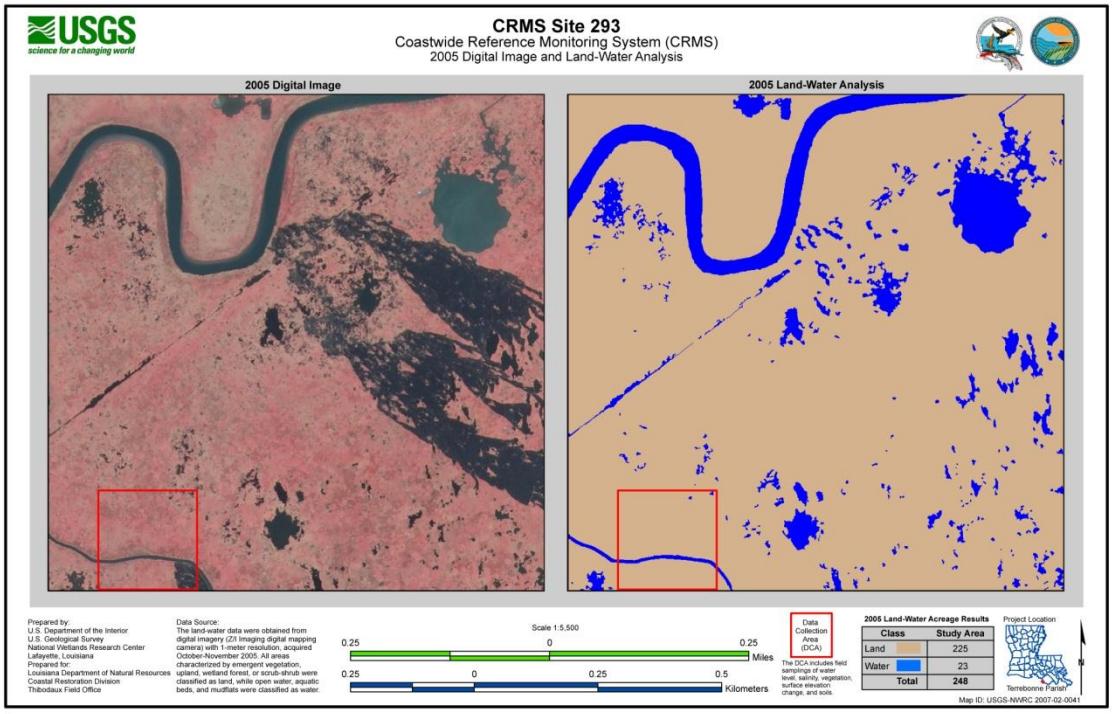


Figure. 2005 land/water classification of the CRMS0293 1 km square.

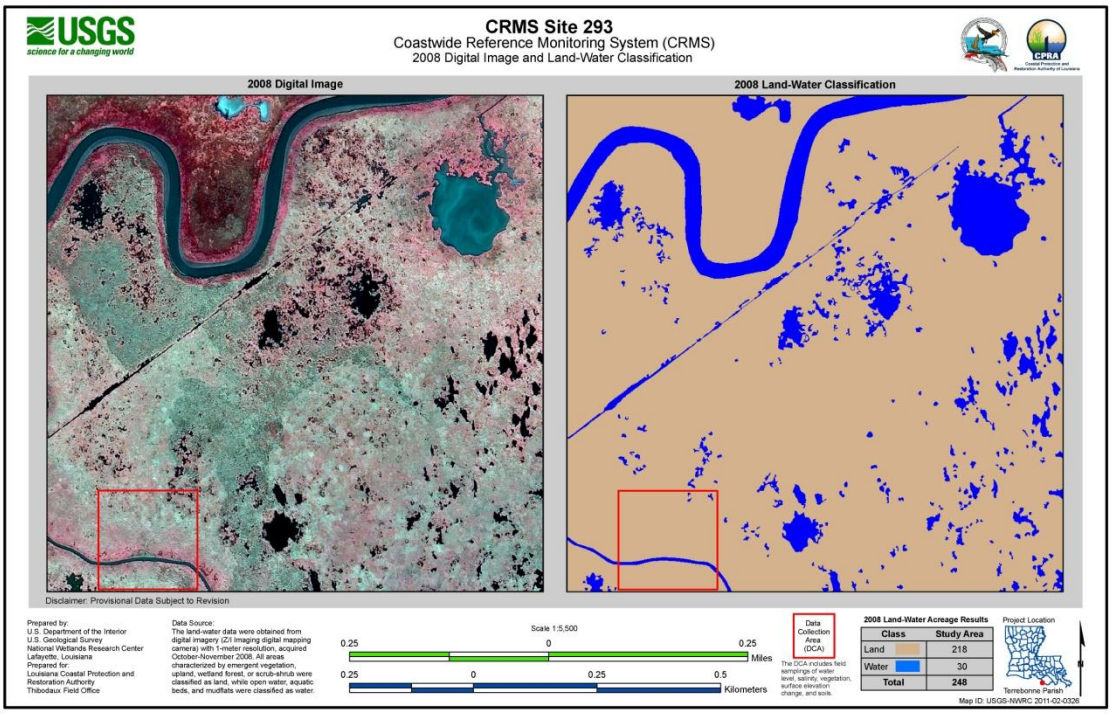


Figure. 2008 land/water classification of the CRMS0293 1 km square.

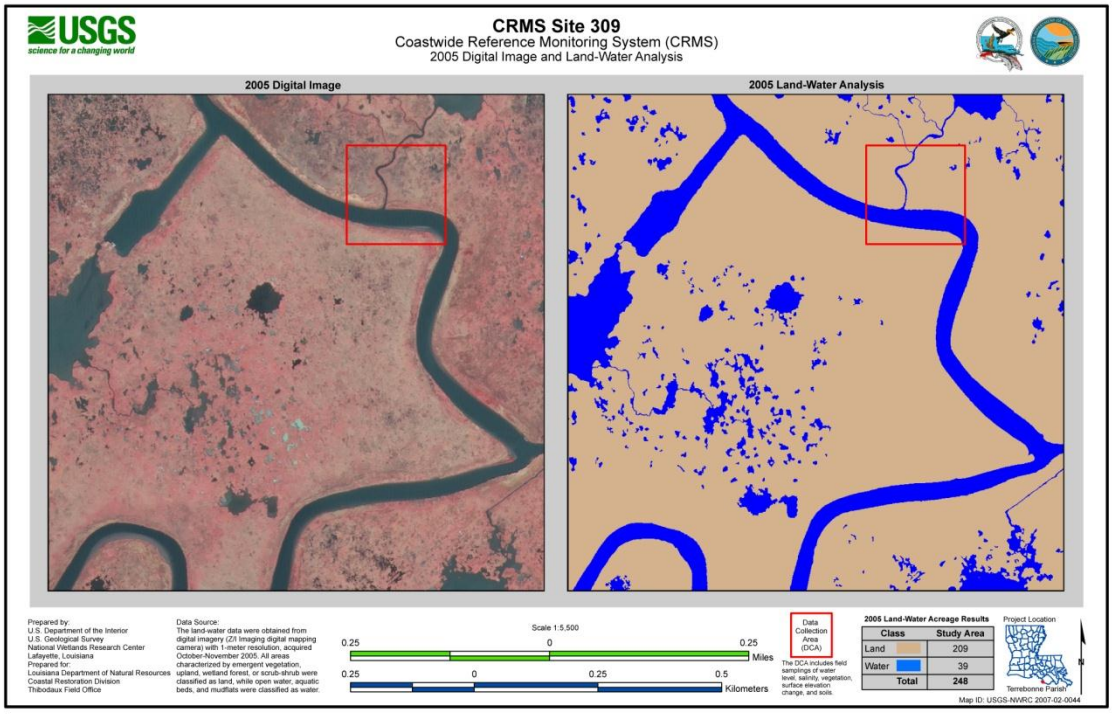


Figure. 2005 land/water classification of the CRMS0309 1 km square.

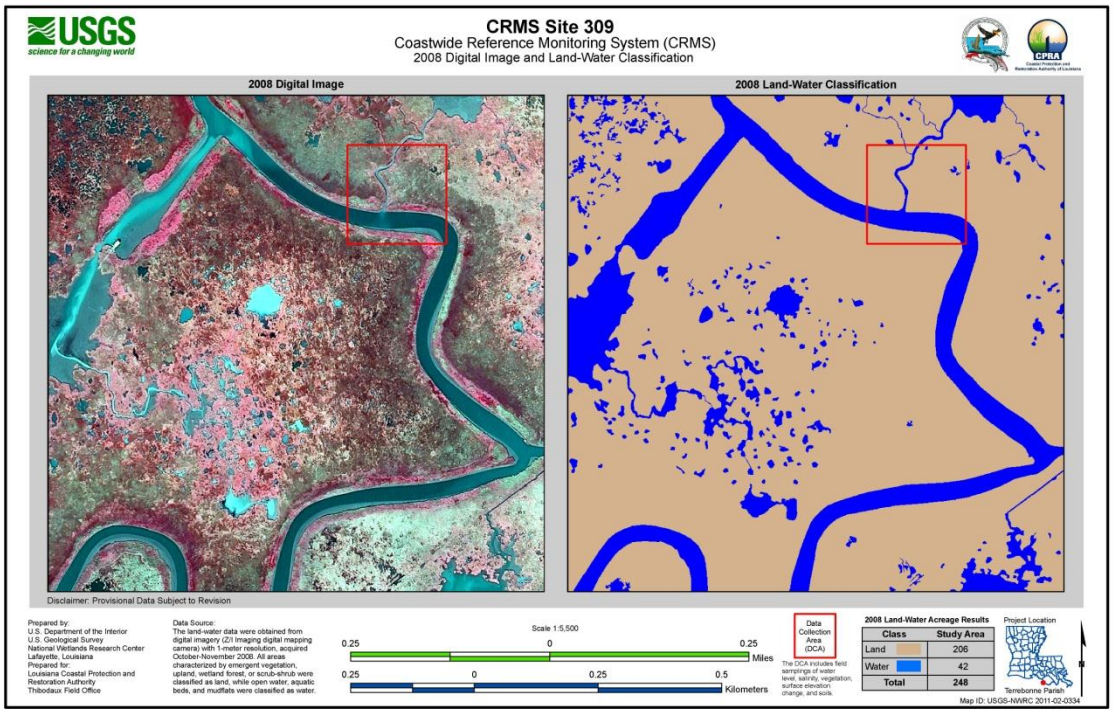


Figure. 2008 land/water classification of the CRMS0309 1 km square.