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

2008 Operations, Maintenance, and Monitoring Report

for

Oaks/Avery Canals Hydrologic Restoration

State Project Number TV-13a
Priority Project List 6

September 2009
Vermilion Parish

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Suggested Citation:

Barrilleaux, T. and D. Pontiff 2008. *2008 Operations, Maintenance, and Monitoring Report for Oaks/Avery Canals Hydrologic Restoration (TV-13a), Coastal Protection and Restoration Authority of Louisiana, Office of Coastal Protection and Restoration, Lafayette, Louisiana. 60 pp.*

2008 Operations, Maintenance, and Monitoring Report
For
Oaks/Avery Canals Hydrologic Restoration (TV-13a)

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I. Introduction

The Oaks/Avery Canals Hydrologic Restoration project area encompasses 2,876 acres (1,164 ha) located in the southeastern portion of Vermilion Parish and southwestern portion of Iberia Parish, north of Vermilion Bay (figure 1). The Vermilion Bay shoreline makes up most of the southern boundary of the project area. The major tributaries and waterways within the project area are Oaks Canal to the west, Avery Canal on the east, and the Gulf Intracoastal Waterway (GIWW) traversing the project area east to west. Union Oil Canal makes up the eastern boundary of the hydrologic unit of the project north of the GIWW. Most soils in this area are classified as Lafitte Muck, which are very poorly drained, very fluid, organic soils in brackish marshes. The area is composed of approximately 1,936 acres (783 ha) of brackish marsh and 791 acres (320 ha) of open water, 4.8% of which is dominated by submerged aquatic vegetation (SAV), with the remainder made up of non-marsh habitats (Natural Resources Conservation Service 1998). The dominant SAV species is *Myriophyllum spicatum* (Eurasian watermilfoil). The vegetation in the area has historically been classified as brackish and intermediate marsh (O'Neil 1949, Chabreck and Linscombe 1968, 1978, 1988). Land loss rates in the project area averaged 8 acres/yr from 1956-1978. Pre-project erosion rate estimates for the Vermilion Bay shoreline and the GIWW bank in the project area were 13 ft/yr (4 m/yr) and 5-10 ft/yr (1.5-3 m/yr) respectively.

This project consists of the following unrelated restoration components designed to address different land loss problems within the project area: protection of Vermilion Bay shoreline with vegetative plantings; protection of GIWW bankline with rock dikes; stabilization of water level variability north of the GIWW and east of Oaks Canal by installation of a steel sheetpile weir in the "Cowpath" canal, a rock plug in a large breach in the north bank of an oilfield canal, spoilbank restoration along sections of the western bank of Union Oil Canal, and bank paving of the east and west banks of Oaks Canal at its convergence with Vermilion Bay. Approximately 1,200 ft of bankline protection was installed on the south bank of the GIWW adjacent to the area where Bayou Petite Anse exits Tigre Lagoon and enters Vermilion Bay. The remaining 6,300 ft of bankline stabilization was installed on the north bank of the GIWW immediately west of Oaks Canal.

During the life of the 20 year project, 160 acres (65 ha) of wetlands is projected to be protected. Approximately 34,000 *Spartina alterniflora* (smooth cordgrass) plants were planted along 5.1 miles of the Vermilion Bay shoreline in the summer of 2000. Project construction of structural components began on June 25, 2002 with the construction of approximately 7500 linear feet of rock dikes to protect the shoreline of the GIWW by contractor Luhr Brothers, Inc. of Columbia, Illinois. Subcontractors Bertucci Construction Company of Jefferson, Louisiana and Berry Brothers General Contractors, Inc. of Berwick, Louisiana completed project construction with the installation of a low sill sheetpile structure, low sill rock weir, spoilbank refurbishment, and navigation aids. Construction of the $2.8 million project was completed on October 14, 2002.

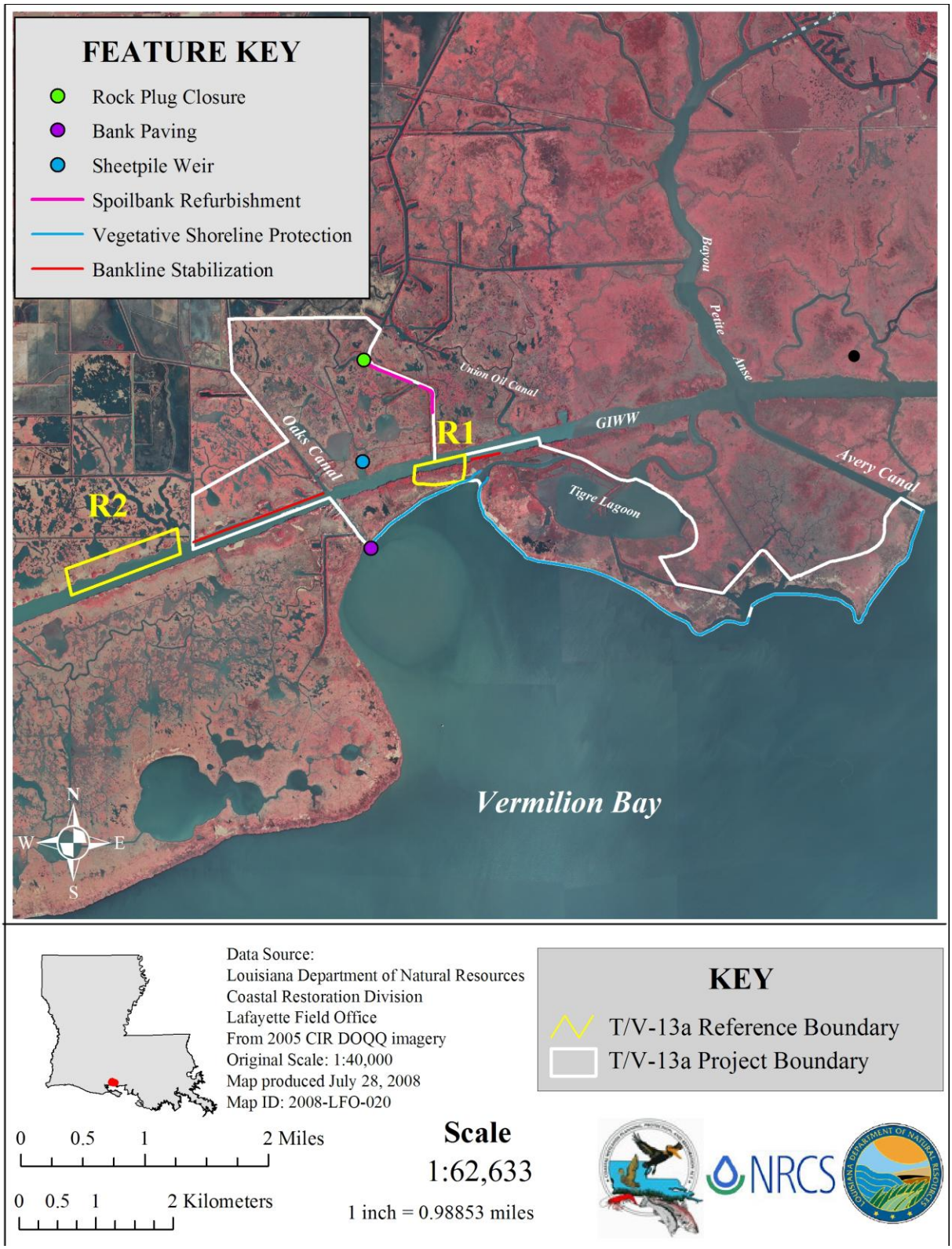


Figure 1. Locations of the TV-13a project and reference areas and project features.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Oaks/Avery Canals Hydrologic Restoration Project (TV-13a) 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, OCPR shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, and construction 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.

An inspection of the Oaks/Avery Canals Hydrologic Restoration Project (TV-13a) was held on April 24, 2008 under partly cloudy skies and mild temperatures. In attendance were Stan Aucoin, Melvin Guidry, Troy Barrilleaux and Darrell Pontiff of OCPR. Dale Garber represented NRCS. Parties met at the Lafayette Field Office of CED and proceeded to the TV-13a project area. The annual inspection began at the rock revetment at the west end of the north bank rock shoreline protection along the GIWW.

The field inspection included a complete visual inspection of the entire project site. Staff gauge readings and existing temporary benchmarks were used to determine approximate elevations of water, rock weirs, earthen embankments, steel bulkhead structures and other project features. Photographs were taken at each project feature (see Appendix A) and Field Inspection notes were completed in the field to record measurements and deficiencies (see Appendix C).

b. Inspection Results

Site 1—Rock dike/North bank

The dike is in excellent condition. Approximately 60 linear feet on the eastern end at a barge slip continues to settle but is in no need of any repairs. East and west tie-ins are stable, however there is some minor erosion occurring at the east tie-in, which will be monitored on future inspections. (Appendix A; photos 1-3)

Site 2—Rock paving at Oaks Canal

High tides concealed the area along the western bank paving where some rock had apparently slid into the channel. No worsening in this area was evident. The bank between the bay and Bayou Hebert is still only about 6 feet wide and has not gotten any worse. No immediate maintenance required at this time. (Appendix A; photos 4-5)

Site 3—Cow path Structure
The structure is in excellent shape. Signage is stable. Wingwalls show no signs of any erosion. Three SS bolts are missing from pile cap and will eventually need to be replaced, probably by OCPR personnel. The levee from the east side of the structure to the GIWW is stable. No maintenance required at this time. The boat lifting device installed by the landowners on the western half of the structure has been removed and is on the ground adjacent to the structure. The landowner installed channel iron to accept stoplogs is still on the structure. This will be investigated further by OCPR. (Appendix A; photos 6-8)

Site 4—Earthen closures
The closures are holding up well. Vegetation has been established. No need for any repairs. (Appendix A; photos 9-10)

Site 5—Rock plug
The plug is in good condition. There appears to be some rock moved from the east side of the closure allowing water to go over the rock at high tides. Tie-ins are stable. No need for any repairs. (Appendix A; photo 11)

Site 6—Rock dike/South bank
The dike is in immediate post construction condition and in no need of any repairs. (Appendix A; photo 12, 13, & 14)

Site 7—Vegetation plantings
The shoreline plantings were not directly inspected on this trip due to time and wave constraints. They are, however, expected to be in similar condition as previous inspections. All vegetation in the area, including the vegetation behind the rock dikes at the mouth of the Oaks Bayou Canal, is in good condition. (Appendix A; photo 15)

c. Maintenance Recommendations

i. Immediate/ Emergency Repairs
None

ii. Programmatic/ Routine Repairs
None

d. Maintenance History

General Maintenance: Below is a summary of completed maintenance projects and operation tasks performed since October 2002, the construction completion date of the Oaks/Avery Canals Bayou Hydrologic Restoration Project.

No maintenance has been required on this project since construction was completed.

III. Operation Activity

a. Operation Plan

There are no water control structures with operational features associated with this project; therefore, no Structural Operation Plan is required.

b. Actual Operations

There are no water control structures with operational features associated with this project, therefore no required structural operations.

IV. Monitoring Activity

a. Monitoring Goals

The objectives of the Oaks/Avery Hydrologic Restoration Project are:
1. Protect the Vermilion Bay shoreline through the planting of *S. alterniflora*.
2. Protect sections of the GIWW bank from erosion through use of rock dikes.
3. Stabilize water levels in the hydrologic unit.

The following goals will contribute to the evaluation of the above objectives:
1. Reduce erosion rate on the northern shoreline of Vermilion Bay.
2. Reduce erosion rate of specific high-risk portions of the GIWW bank.
3. Attenuate rapid water level fluctuations in hydrologic unit.
4. Reduce rate of loss of emergent vegetated marsh area in the hydrologic unit.

b. Monitoring Elements

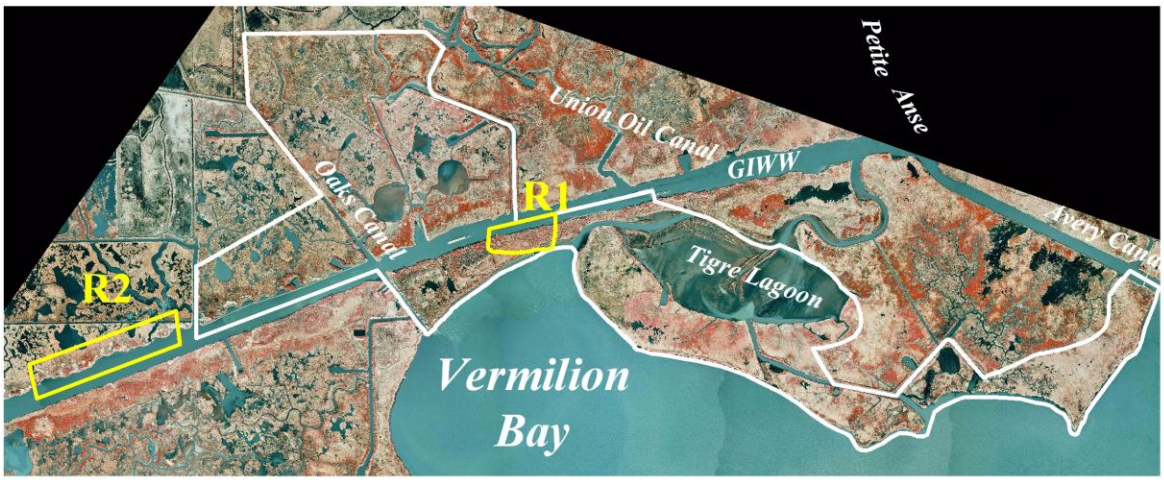
Aerial Photography:

Near-vertical color-infrared aerial photography (1:12,000 scale) was used to measure vegetated and non-vegetated areas for the project and reference areas. The photography was obtained in 2000 (pre-construction), 2002, and 2006 (post-construction) and will be acquired in 2014. The original photography was checked for flight accuracy, color correctness, and clarity and was subsequently archived. Aerial photography was scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures (Steyer et al. 1995, revised 2000) (figures 2, 3, 4).

Shoreline Change:

The shoreline position was monitored along Vermilion Bay, along sections of the GIWW bank where rock dikes were constructed, and along the reference area bankline in R1 and R2. A differential Global Positioning System (dGPS) was used to map the Vermilion Bay shoreline in 2000 (immediately following planting of vegetation), 2003, and 2007. Shoreline position will be surveyed in years 2010, 2012, 2015, and 2018. The shoreline along the GIWW in the project and reference areas was mapped in 2003 immediately following construction of the rock dike and 2006. Future surveys will follow the schedule listed above. The difference between shoreline change in the reference areas and the project will be used to estimate the area of wetlands protected by the rock dikes along the GIWW. Because of the lack of a suitable reference area for the Vermilion Bay shoreline, the benefits of the plantings will be inferred from the survival of the plantings and temporal changes in shoreline position, from which changes in rate of loss can be calculated.

Figure 2. Photomosaic of the 2000 color-infrared aerial photography for the TV-13a project and reference areas.



Data Source:
Louisiana Department of Natural Resources
Coastal Restoration Division
Lafayette Field Office
From 2002 CIR Photomosaic
Original Scale: 1:24,000
Map produced August 1, 2005
Map ID: 2005-LFO-025

KEY
T/V-13a Reference Boundary
T/V-13a Project Boundary

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

Scale
1:60,000
1 inch equals 0.946970 miles

Figure 3. Photomosaic of the 2002 color-infrared aerial photography for the TV-13a project and reference areas.

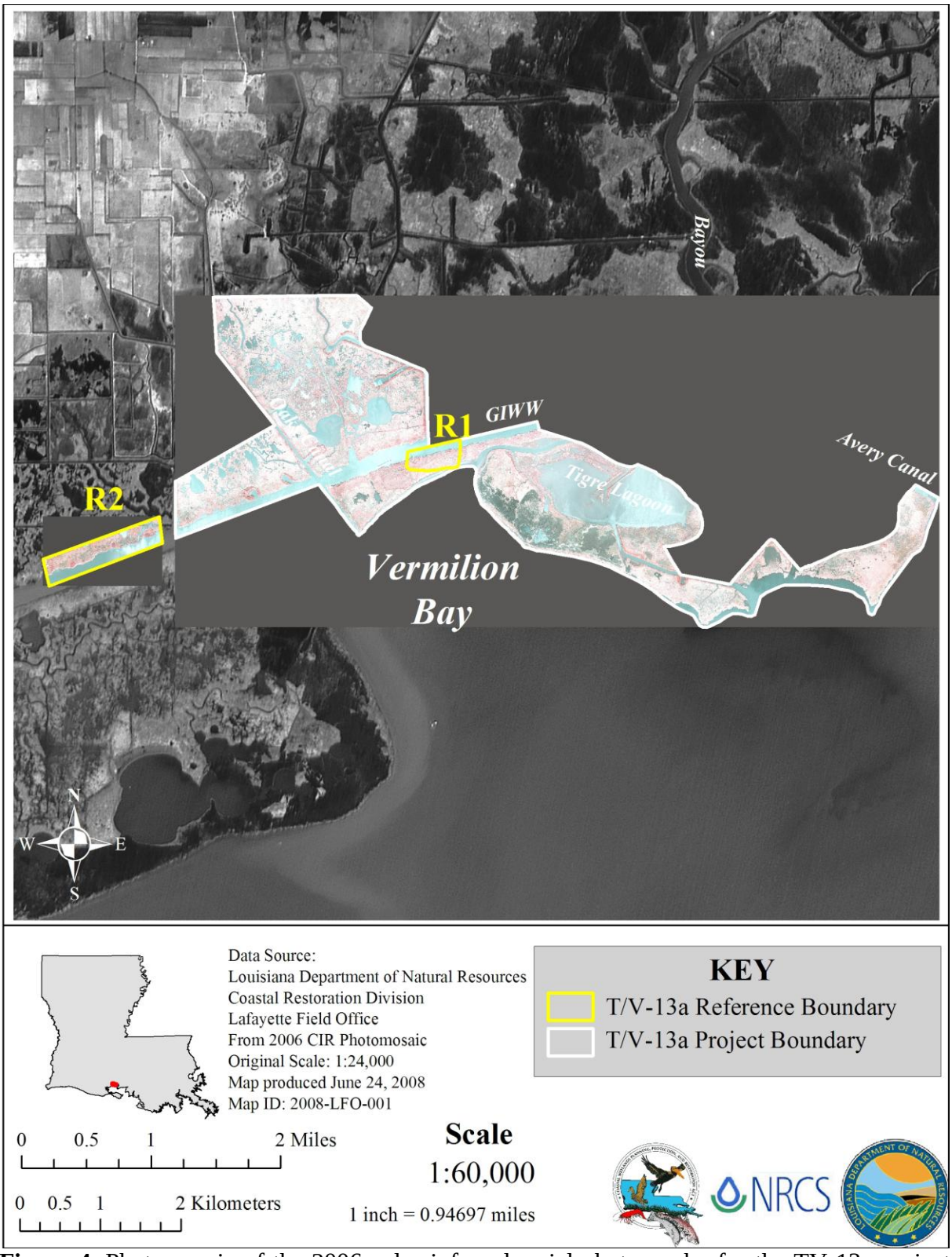


Figure 4. Photomosaic of the 2006 color-infrared aerial photography for the TV-13a project and reference areas.

Water Level:

No new data were collected in 2007. Salinity and water level data have been collected at the following continuous recorder stations (figure 5):

Station
TV13-01
TV13-2R
TV13-3R
TV13-4R

* Stations are not surveyed to NAVD 88 since stabilizing water level variability was the goal.

To monitor hydrologic conditions (water depth, salinity) and document water levels within the hydrologic unit, one data recorder was placed inside the unit and three recorders were placed outside the project area at three locations along a semi-natural waterway at increasing distances from the GIWW (figure 5). Water level data were used to document the water level variability in the project area relative to the reference data recorders. Water level data were collected at the shortest interval possible with the recorders (every 30 seconds) for 10 days each month during a 6-month period for the year 1999 (preconstruction) and year 2003 (post-construction). Specifically, water level data have been collected at the above-mentioned stations from 02/05/1999 – 09/02/1999 and 02/24/2003 – 09/06/2003.

Vegetative Shoreline Protection:

No new data were collected in 2007. The general condition of *S. alterniflora* plantings along Vermilion Bay was documented by monitoring twenty 40-ft long vegetation sampling plots (3% of entire planted area) (figure 6). Each plot consisted of 16 plantings with the sampling location determined by a random numbers table based on distance and marked with a pole. Species composition and percentage cover for the 16-plant plot was documented using the Braun-Blanquet procedure. Survival was determined as a percentage of the number of live plants to the number planted (within the plot) (Mendelssohn et al. 1991). These criteria were documented in 2001.

CRMS-*Wetlands* (CRMS) Supplemental

In addition to project specific monitoring elements, other data types are collected at CRMS sites which can be used as supporting or contextual information (figure 7). Data types collected at CRMS sites include hydrologic from continuous recorder (mentioned above), vegetative, physical soil characteristics, discrete pore water, surface elevation, and land:water analysis of 1 km^2 area encompassing the station. Continuous salinity data were collected hourly. Continuous data were not adjusted to a datum such as NAVD88. Future surveys are planned to tie in these data to a vertical datum. For this report, data from one site within the project area are compared to data from two sites outside the project area in a traditional project versus reference manner. 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 (hydrology, plant productivity, and soil surface elevation

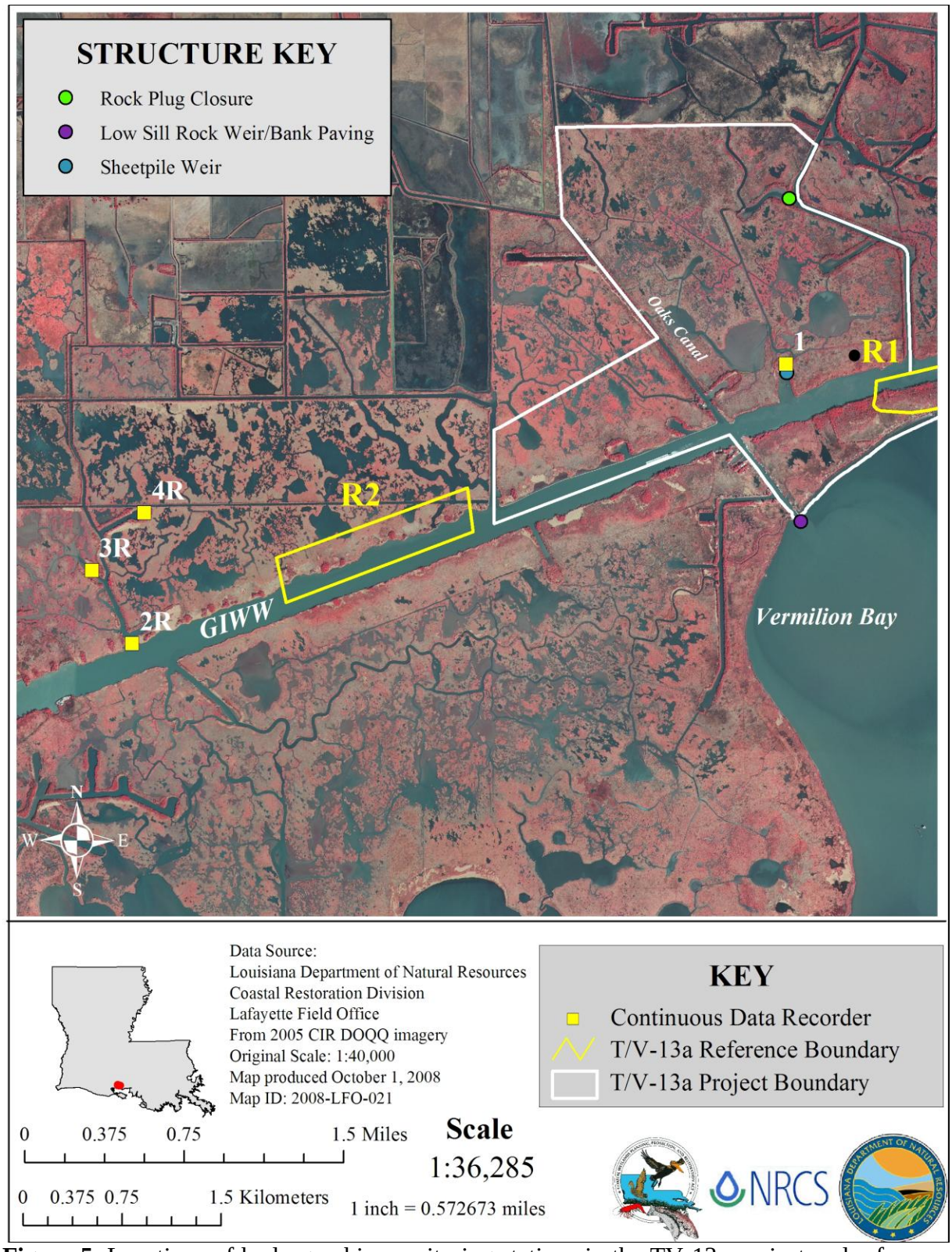


Figure 5. Locations of hydrographic monitoring stations in the TV-13a project and reference areas.

change) at different spatial scales (local, basin, coastal) to which we can compare project performance.

Discrete pore-water from the soil salinity at 10 and 30 cm was collected at five of the vegetation plots during vegetation sampling. Pore water was extracted with a sipper tube assembly (rigid aquarium tubing, flexible hose, and syringe), and salinity was measured using a hand held salinity meter (YSI 30 Salinity, Conductivity, Temperature Meter). One site inside and two sites outside the project were selected to compare specific locations for this report (figure 7).

Emergent vegetation parameters will be evaluated at each CRMS site using techniques described in Steyer et al (1995) to describe species composition, richness, and relative abundance; in addition, overall percent cover and height of the dominant species will be monitored. Annually at each site, data will be collected and averaged from ten, 4-m^2 sample plots randomly established along a 282.8 m transect that crosses diagonally through a 200-m × 200-m vegetation plot in middle of the CRMS site. The percent cover of the plot and of each species was fed into a floristic quality index based on the marsh type the data was collected. Floristic Quality Indices (FQIs) have been developed for several regions to determine the quality of a wetland based on its species composition (Cohen et al., 2004; Bourbaghs et al., 2006). This FQI was developed by Jenneke Visser and an expert panel on Louisiana coastal vegetation as part of CRMS analytical working group in 2007 to develop integrated data indices (hydrology, plant productivity, and soil surface elevation change) at different spatial scales (local, basin, coastal) to which we can compare project performance. The panel provided an agreed upon score (Coefficient of Conservatism or CC Score) from 0 to 10 for each species in a list of ~500 plant species occurring in Louisiana's coastal wetlands (Table 2). CC scores are weighted by percent vegetative cover and summed to determine the FQI for the CRMS site. CRMS sites inside and outside the project area were used for this report .

Soil cores were collected one time to describe soil properties (bulk density and percent organic matter). Three, 4" (10.16-cm) diameter cores were collected to a depth of 24 cm and divided into 6, 4-cm sections at each site. The soil was processed by the Department of Agronomy and Environmental Management at Louisiana State University. Cores were collected at the site inside the project area, and suitable cores (quality or same marsh type) were collected from one site (527) outside the project area.

Soil surface elevation change utilizing a combination of sediment elevation tables (RSET) and vertical accretion from feldspar horizon markers will be measured twice per year at each site. This data will be used to describe general components of elevation change and establish accretion/subsidence rates. The RSET will be surveyed to a known elevation datum (ft, NAVD 88) so it can be directly compared to other elevation variables such as water level. Currently, data has not been collected over enough time to calculate viable rates; therefore, elevation change is not included in this report.

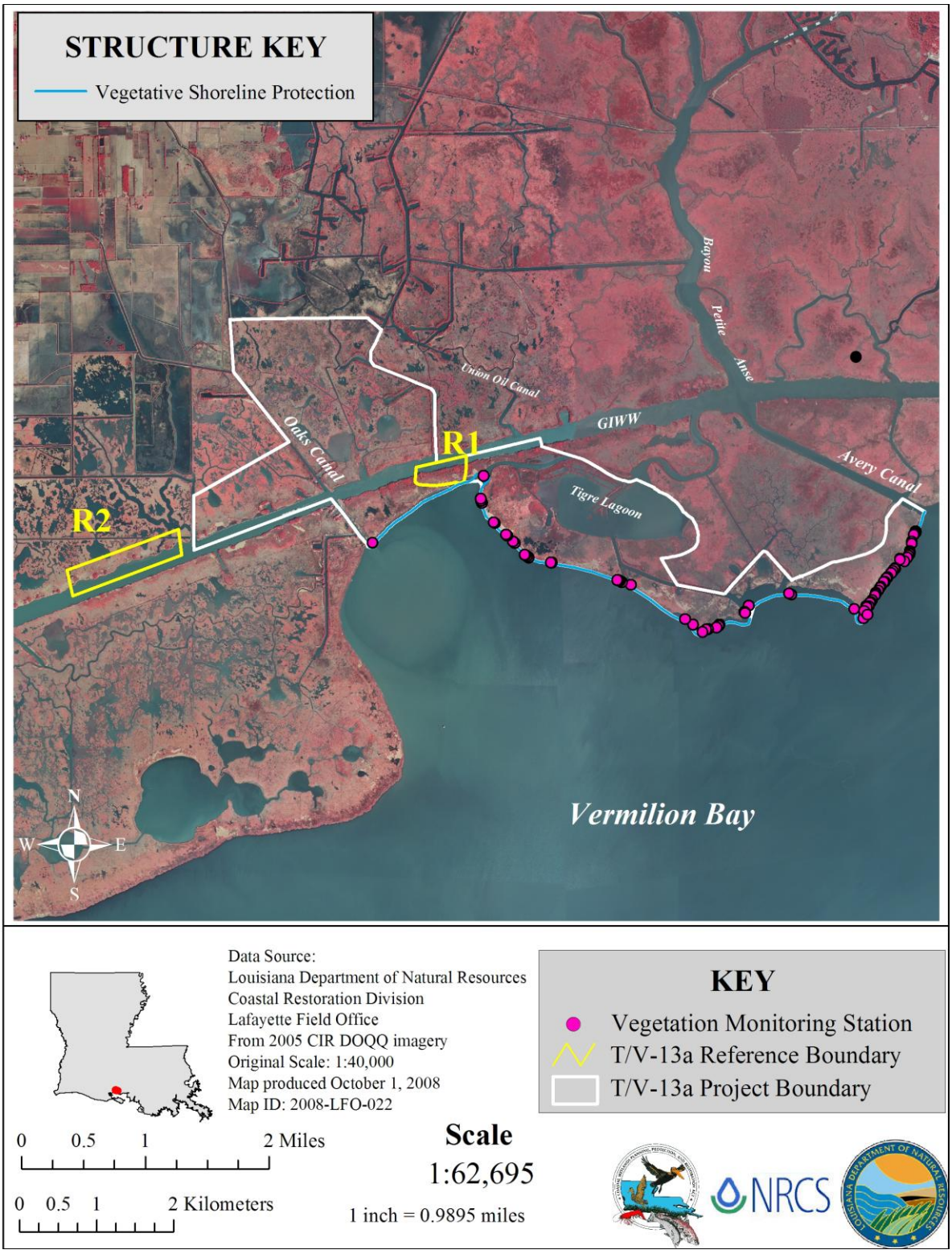


Figure 6. Locations of planted vegetative survey stations in the TV-13a project area.

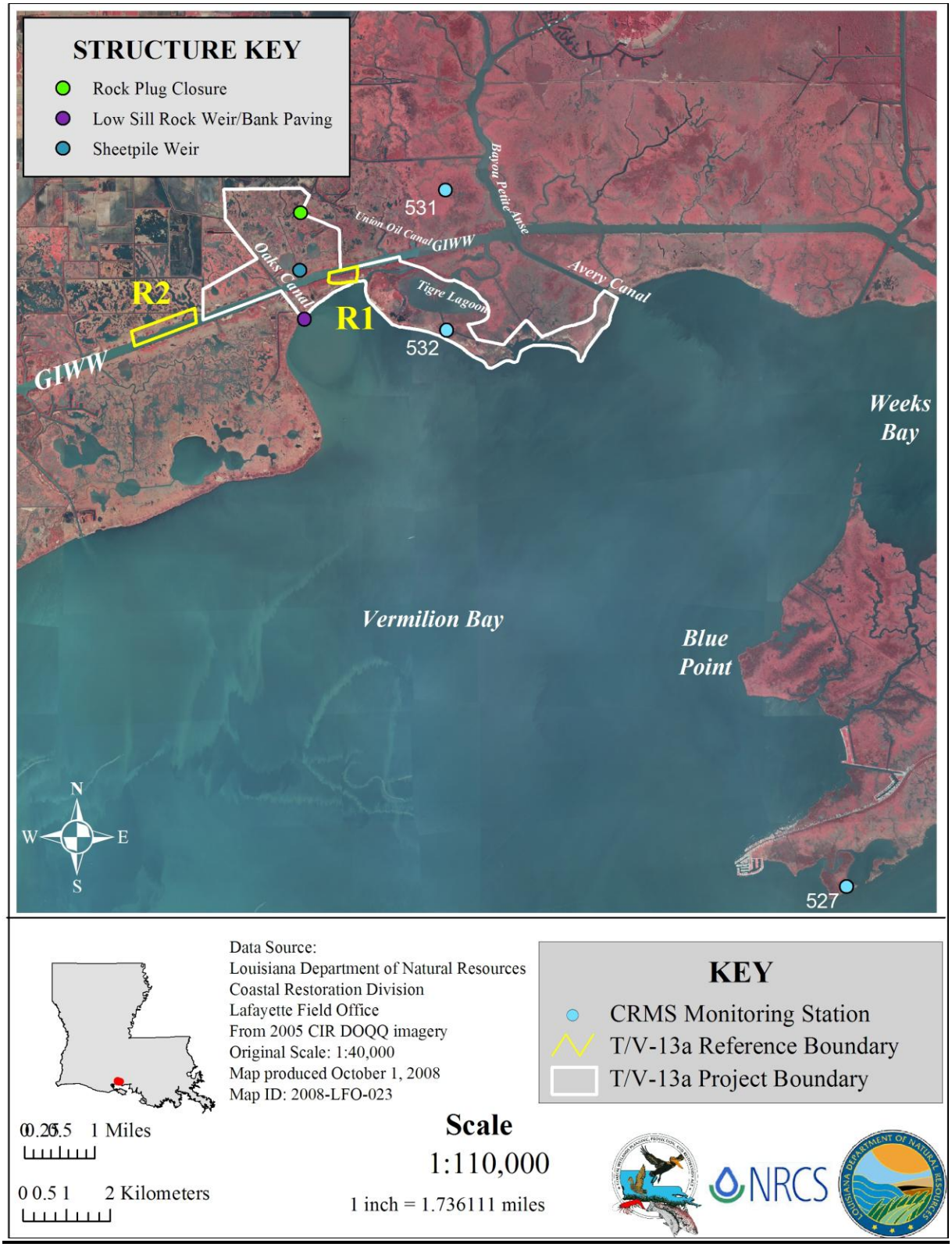


Figure 7. Location of CRMS monitoring sites within and near the TV-13a project area.

Aerial photography (color infrared, CIR) of each 1 km^2 CRMS site and satellite imagery (Landsat Thematic Mapper, TM) of the entire hydrologic basin will be acquired every three years beginning in 2005. The photography and satellite imagery will be classified by land and water to track changes over time. The baseline data has been collected for this data series; however, this information will not be reported until two periods of data have been analyzed in order to evaluate change.

The CRMS station located in the project area is 532. This site is in the portion of the project area affected by the shoreline restoration, but is not affected by the hydrologic management aspect of the project. Reference stations locations were chosen based on tidally influenced marsh in the Acadiana Bays complex which differs from the rest of the coast because the marsh is protected by Marsh Island and not protected by weirs so to limit other hydrologic influences. The two CRMS stations to be compared to the project area station are 527 and 531. Site 527 is similar to the project site, but without any shoreline protection measures. Reference site 531 is nearer to the project than 527. However, this site is farther inland and may not be experiencing the same conditions as the project area site. All three sites are in intermediate marsh. Data types collected at CRMS sites include hydrologic from continuous recorder, vegetative, physical soil characteristics, discrete porewater, surface elevation, and land:water analysis of 1 km2 area encompassing the station.

c. Preliminary Monitoring Results and Discussion

Aerial Photography:

Pre-construction classification indicated 66.1% land and 33.9% water within the project area and 57.7% land and 42.3% water within the reference areas (figure 8). Aerial photography, collected in December 2002, was classified and indicated a slight increase of land (0.1%) in the project area and a slight decrease of land (0.5%) in the reference areas during the period 2000-2002 (figure 9). The 2006 classification indicated 64.6% land and 35.4% water within the project and 48.6% land and 51.4% water in the reference areas (figure 10). These values indicate a loss of 1.5% land in the project area and a further loss of 8.6% land in the reference areas for the period 2002-2006. It is not known to what extent Hurricane Rita caused this increased loss of land in both the project and reference areas. However, land:water analyses for other CWPPRA projects following the hurricane exhibited similar effects. Additionally, these other projects also showed areas of marsh scoured by the storm as observed on the ground. It is believed that this hurricane induced land loss also occurred in the Oaks-Avery project and reference areas as well.

Shoreline Position:

As-built (immediately post-construction) shoreline positions for the project and reference areas along the GIWW were collected following rock dike construction (figure 11) and again in 2007 (figure 12). For the post-construction period through 2007, the project shoreline behind the constructed rock dike prograded an average of 0.4 m/yr (1.2 ft/yr). In the unprotected reference shoreline, the shoreline eroded at an average rate of 0.87 m/yr (2.9 ft/yr). These data are consistent with shoreline change in other rock dike projects built along

the GIWW. Data were collected in 2000 (preconstruction), 2003 (post-planting), and 2007 for the Vermilion Bay shoreline (figures 13, 14). Shoreline loss was minimal (1.5 m/yr [4.9 ft/yr]) during the period 2000-2003 for the majority of the project area, with the exception of a 6000-ft long section southeast of Tigre Lagoon, which exhibited marked shoreline erosion. Loss occurred at a rate of as much as 100 ft/yr (30 m/yr). For the period 2003-2007, which includes the effects of Hurricane Rita, shoreline erosion rates increased to 7.7 m/yr (25.3 ft/yr). In the same 6000-ft long section southeast of Tigre Lagoon, shoreline erosion rates up to 60 m/yr (197 ft/yr) occurred. It is possible that erosion rates increased with time as plantings were lost, or remained consistent with 2000-2003, with the additional loss attributed to Hurricane Rita, which battered the shoreline of the project with high winds and a storm surge of as much as 11-12 ft.

Water Level:

Pre- and post-construction data for the project area station TV13-01 and reference stations TV13-2R, TV13-3R, and TV13-4R are presented in figures 15-18. Due to the large volume of data caused by the short sampling interval, only data from 1 typical day during each study period are presented in graph form. This time interval illustrates the rapid water level changes (boat wake induced) common in the project and reference areas. Short-term water level variability (<1 hr) decreased in the reference stations as a function of distance from the source of disturbance (i.e. the GIWW). Short-term water level variability was significantly lower in the project area following construction and significantly lower than the reference stations (P<0.0001) (figure 19).

Vegetative Plantings:

For the vegetation survey conducted on 7/24/2001, overall survival of *S. alterniflora* plants was 80%. Individual plants were indistinguishable from each other in all plots where plants survived. The remaining plots had no surviving vegetation. Cover estimates ranged from 3-100% with mean cover for surviving plots at 59%. Average plant height was 45.9 in (116.6 cm). Because individual plants were indistinguishable in all surviving plots in 2001, no further surveys will be conducted.

CRMS Supplemental

A comparison of the project area CRMS site and the two reference sites indicated several interesting trends. The soil properties data for the project and reference (CRMS 527) are presented in Figures 20a-b and 21a-b. Bulk density and organic matter content are the only soil parameters addressed in this report. Soil bulk density was lower in the project area than the reference and tended to be highest at the surface and below 20 cm. Overall, bulk densities for both sites were relatively low, ranging from approximately 0.3-0.5 g/cm^3. Analysis of soil organic matter content indicated that organic content was higher in the project area than the reference site. This is also reflected in the project site's lower bulk density as bulk density usually decreases as organic matter content increases. Organic matter content was lowest at the surface and increased with depth for both sites.

Analysis of the vegetation data indicated that percent cover was higher in 2007 than 2006 for both the project area and the two reference areas. For 2007, mean percent cover was higher in the reference areas than the project area (Figures 22-24). For 2006, mean percent cover was

higher for the project area than reference CRMS site 527. Mean cover in the project was lower than reference CRMS site 531 during 2006. In the project area, mean cover was primarily affected by the presence of *Vigna luteola*, which was not present in 2006 (Figure 24). FQI decreased slightly in the project area during the period 2006-2007. There was also a decrease in FQI for reference CRMS site 531 during the same period. FQI exhibited a large increase for reference CRMS site 527 for 2006-2007. For reference CRMS site 527, both mean cover and FQI increased due to the presence of *Vigna luteola* and an increase in *Lythrum lineare* in 2007.

Collected soil porewater data were summarized and showed porewater salinity remained consistent in the project area at the 10 cm depth during the period 2007-2008, while porewater salinity decreased in the two reference sites (Figure 25). It is not known why the project area did not follow the downward trend observed in the reference sites. Soil porewater data indicated a general downward trend in porewater salinity during the data collection period for all sites at the 30 cm depth (Figure 26). This decrease in porewater salinity could indicate freshening due to continued recovery from Hurricane Rita or could simply be the result of climatic factors (i.e. increased precipitation).

Continuous salinity data revealed that the three CRMS sites tracked remarkably well, as all indicated similar surface water trends in salinity (Figure 27). Data collected since site installation were summarized by calculating daily means from the hourly data and then calculating monthly means of the daily means. All sites indicated a spike in salinity during November of 2007, with a return to lower salinities thereafter. Although climatic data were not collected at the site, it can be assumed that factors such as decreased precipitation or a decreased influx of fresh water from the Atchafalaya River contributed to this increase in surface water salinity.

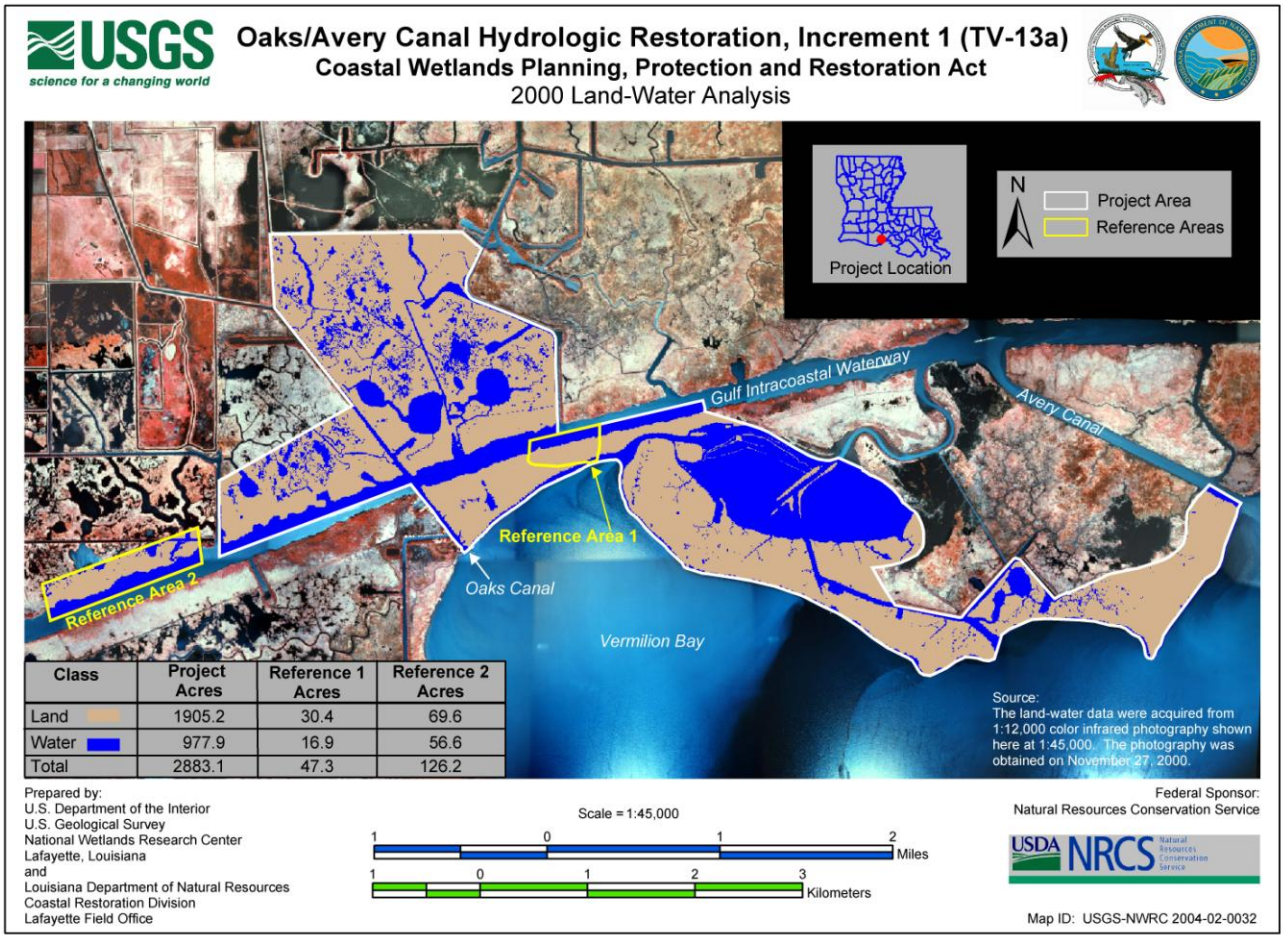


Figure 8. Results of the 2000 Land:Water GIS image classification for the TV-13a project and reference areas.

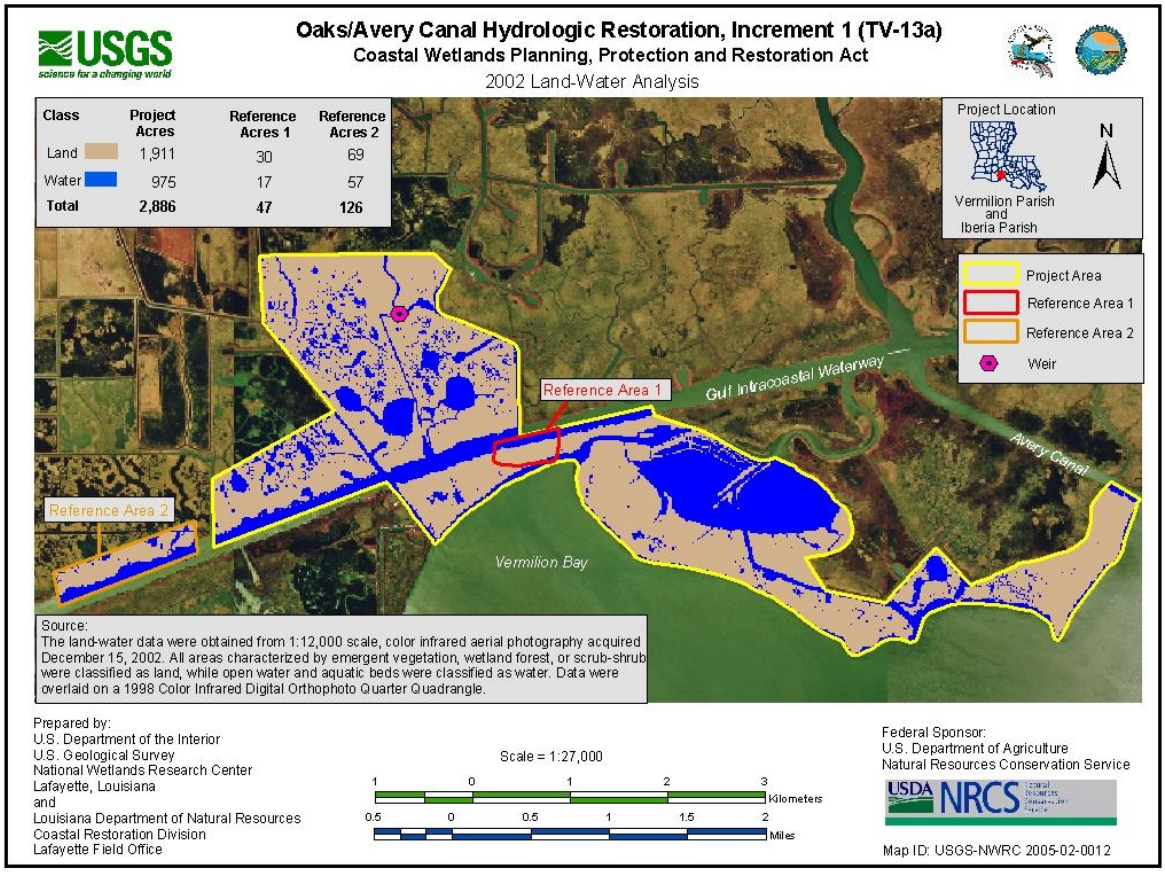


Figure 9. Results of the 2002 Land:Water GIS image classification for the TV-13a project and reference areas.

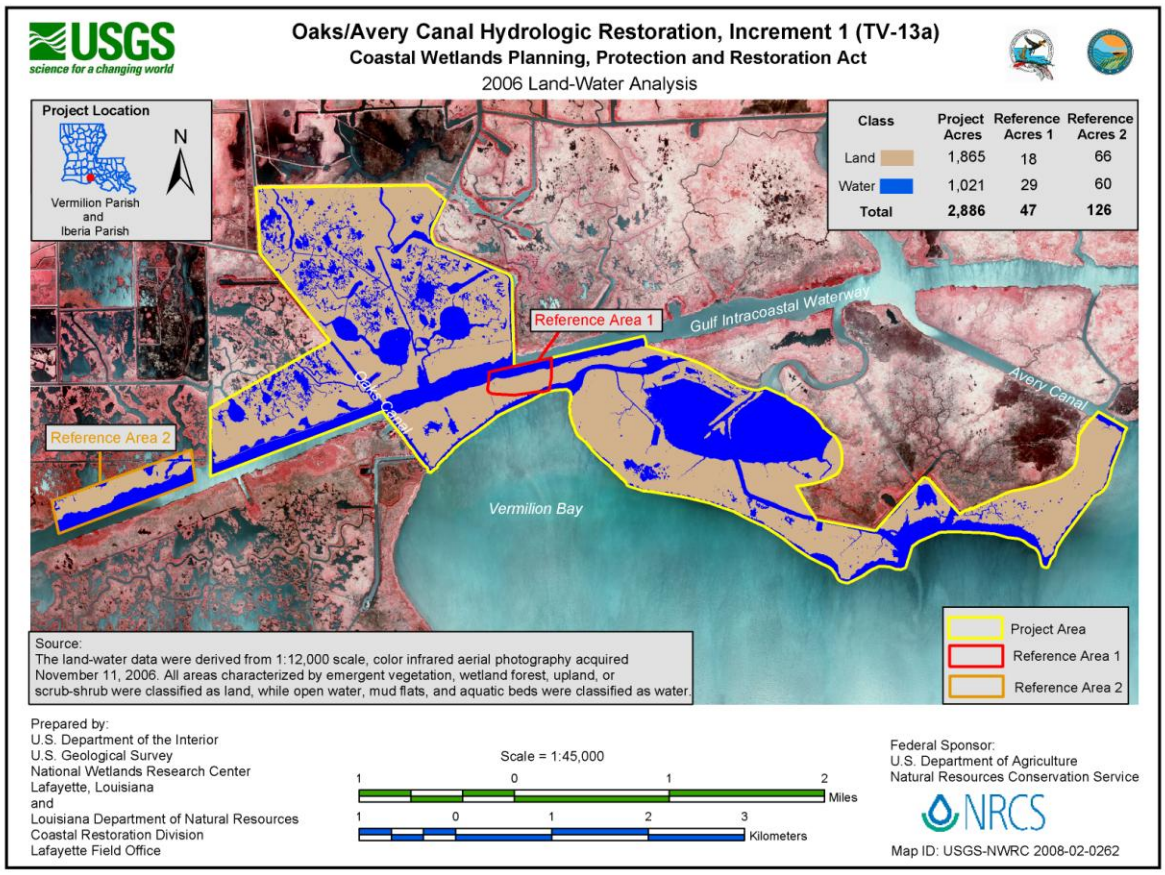


Figure 10. Results of the 2006 Land:Water GIS image classification for the TV-13a project and reference areas.

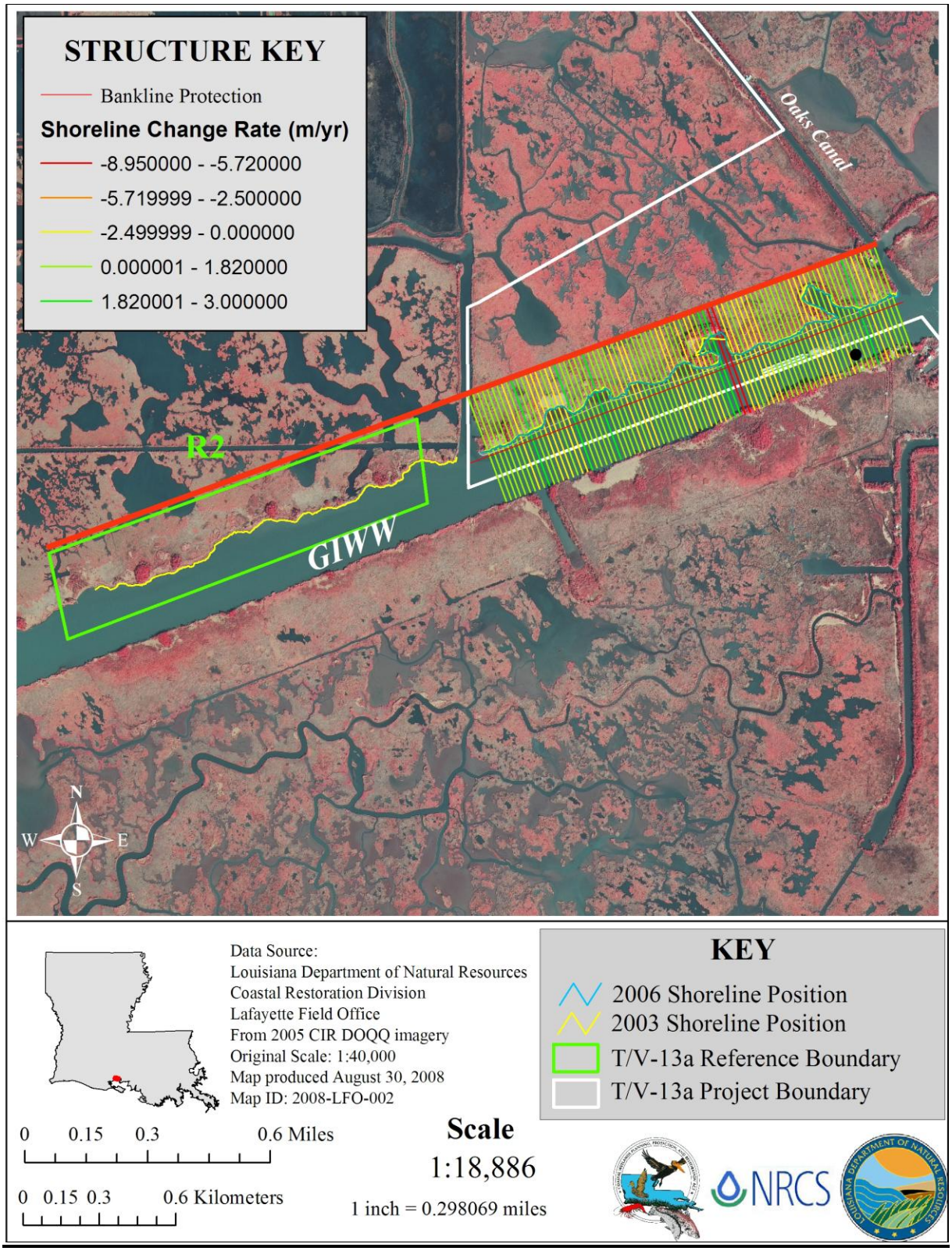


Figure 11. Shoreline change in the TV-13a project area along the GIWW for the period 2003-2006.

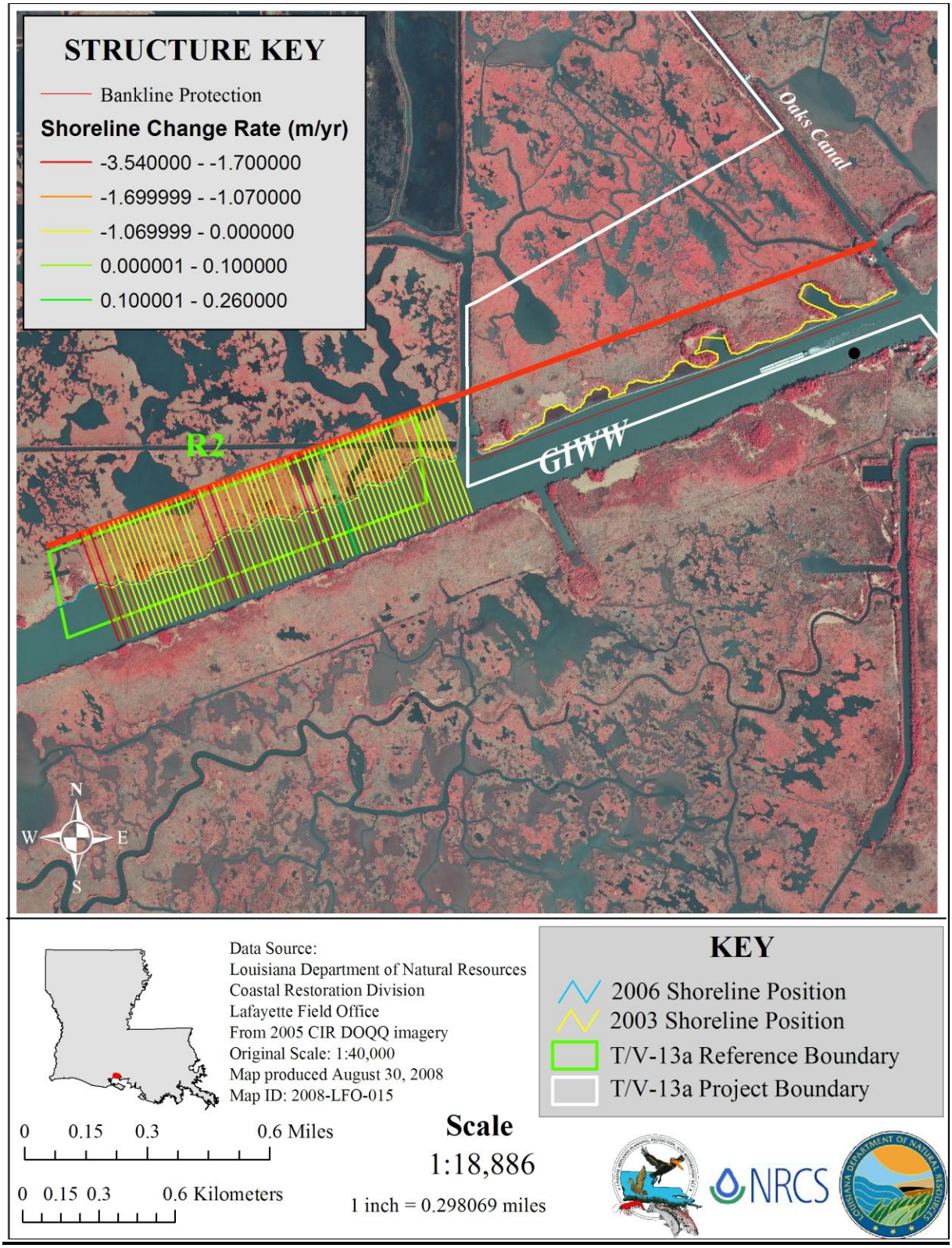


Figure 12. Shoreline change in the TV-13a reference area along the GIWW for the period 2003-2006.

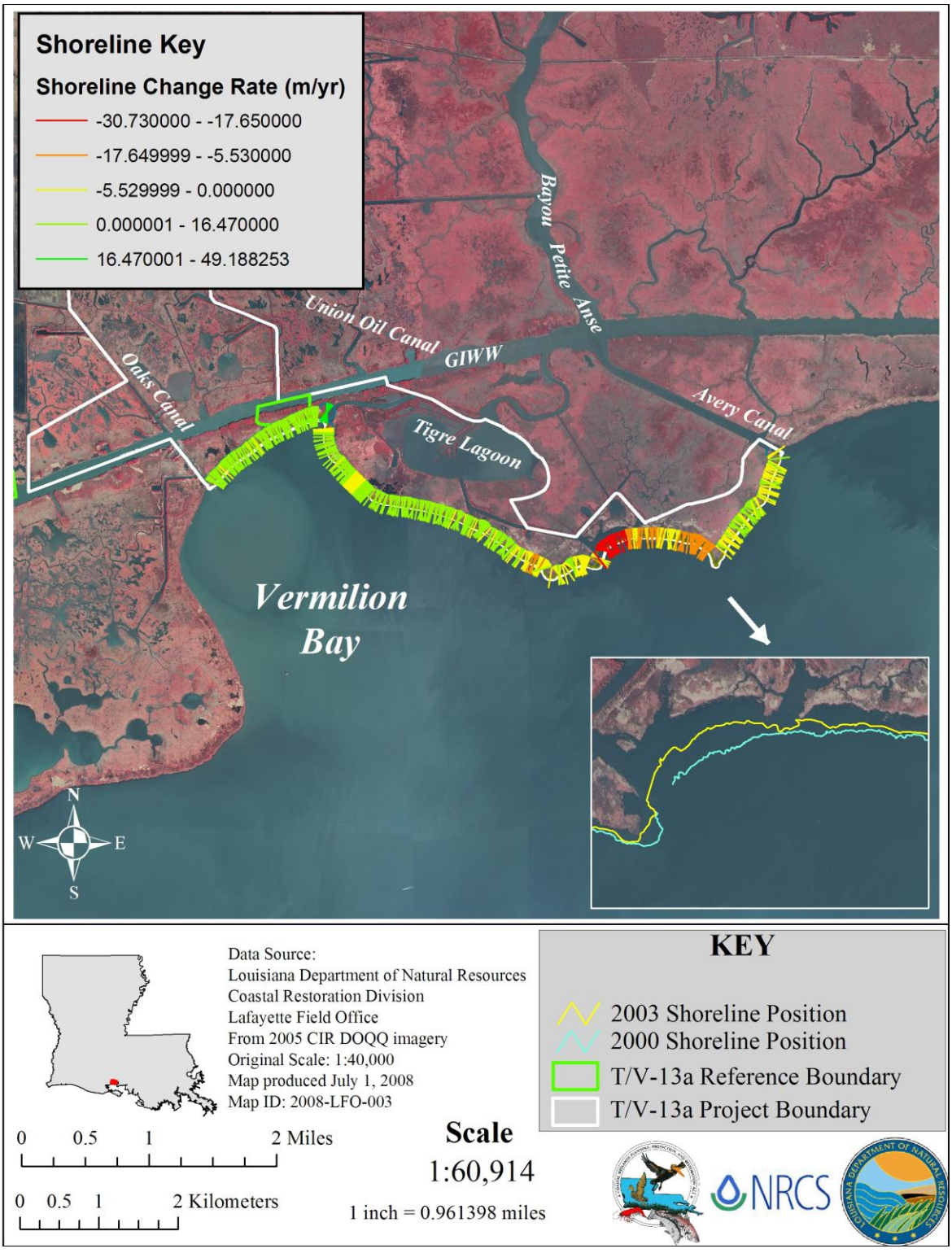


Figure 13. Shoreline change along the shore of Vermilion Bay during the period 2000-2003.

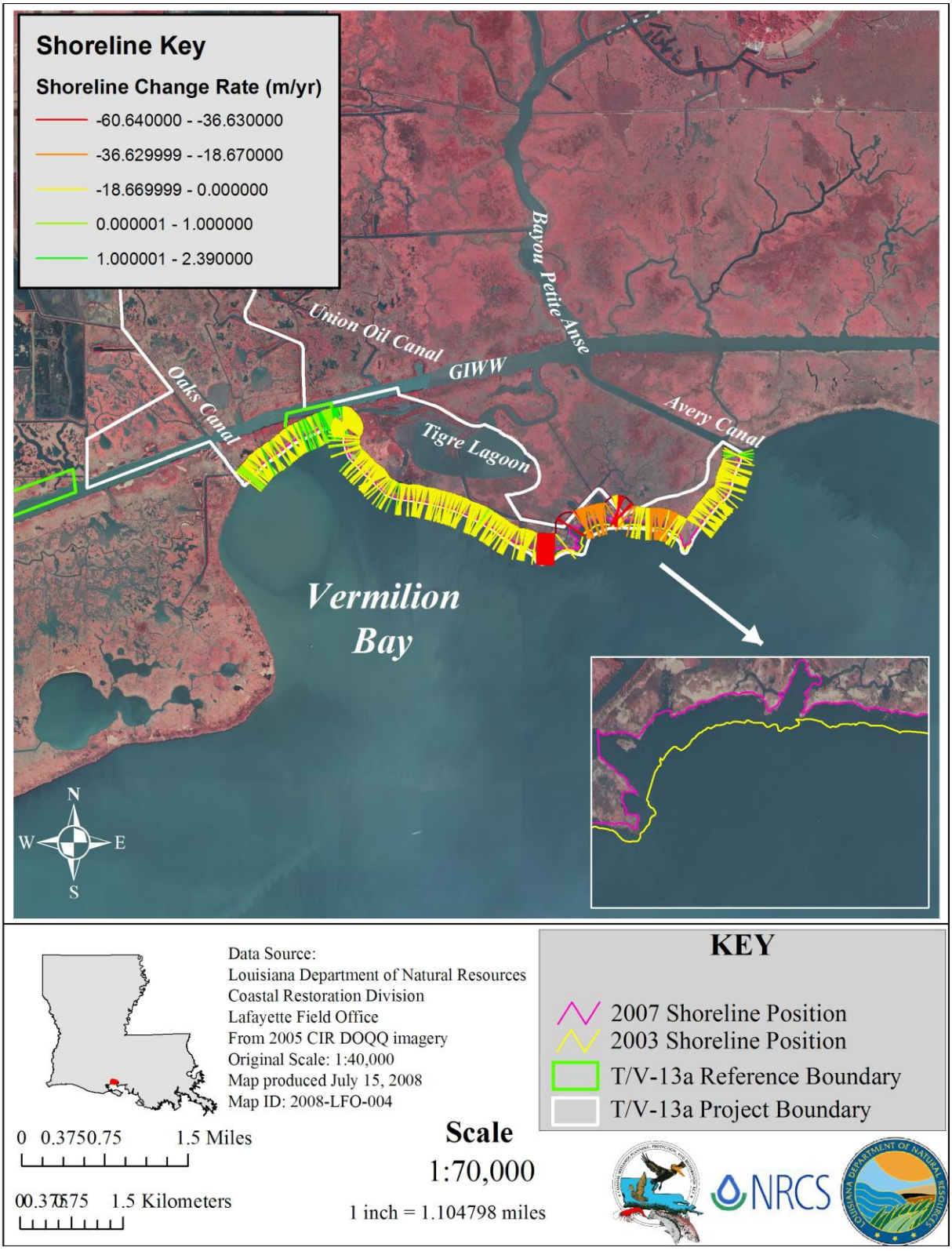


Figure 14. Shoreline change along the shore of Vermilion Bay during the period 2003-2007.

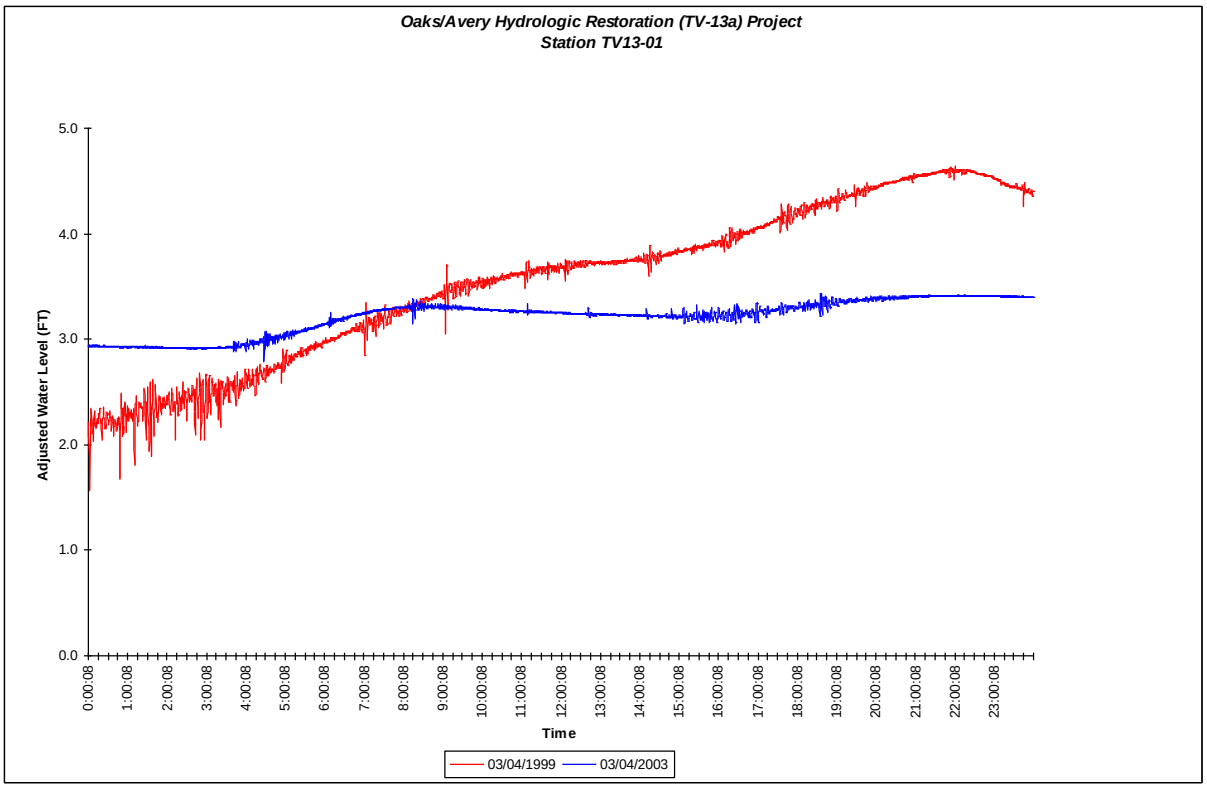


Figure 15. Relative daily water level data (feet) for 1999 and 2003 for Station TV13-01.

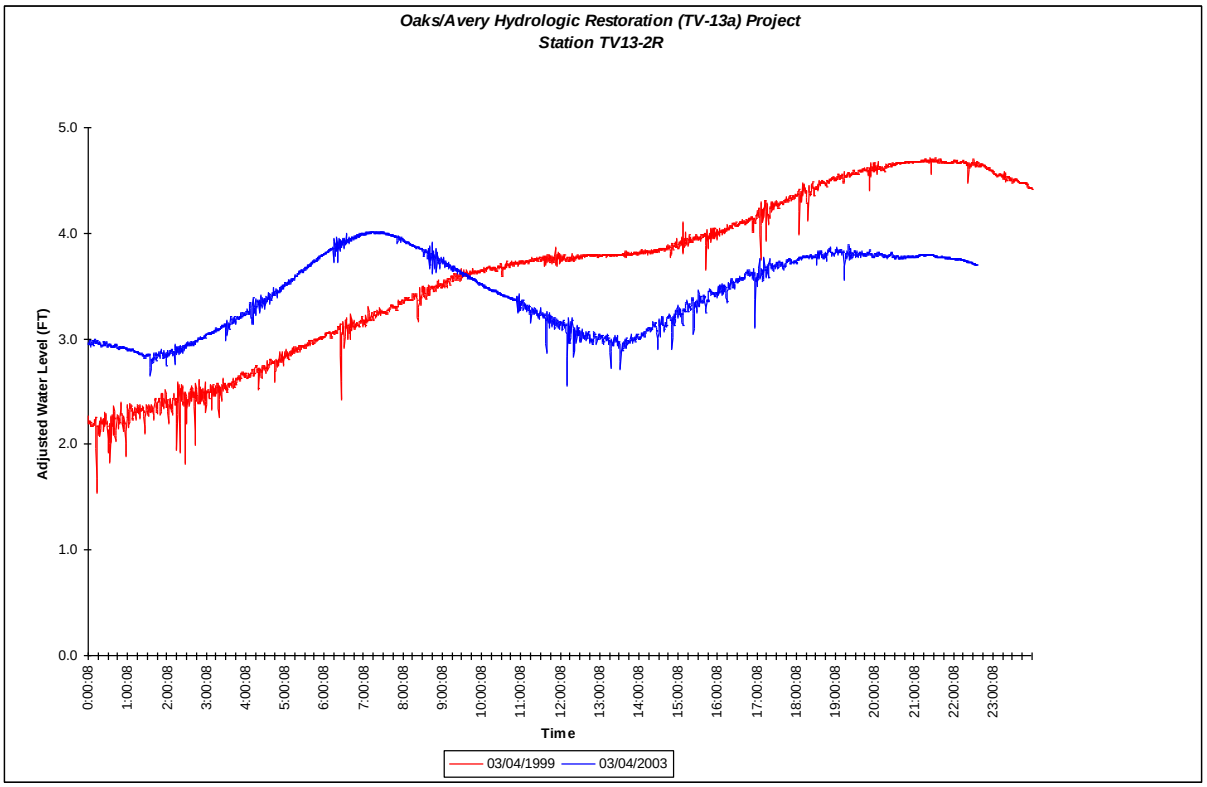


Figure 16. Relative daily water level data (feet) for 1999 and 2003 for Station TV13-2R.

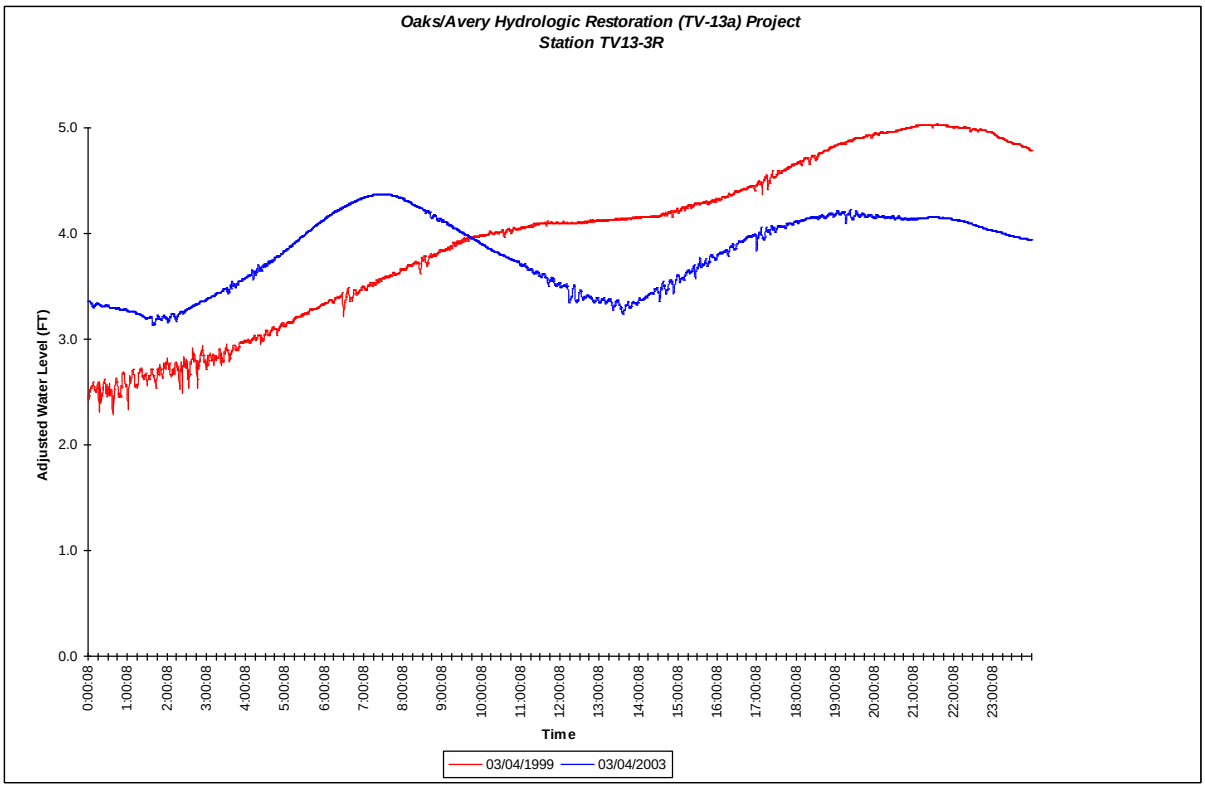


Figure 17. Relative daily water level data (feet) for 1999 and 2003 for Station TV13-3R.

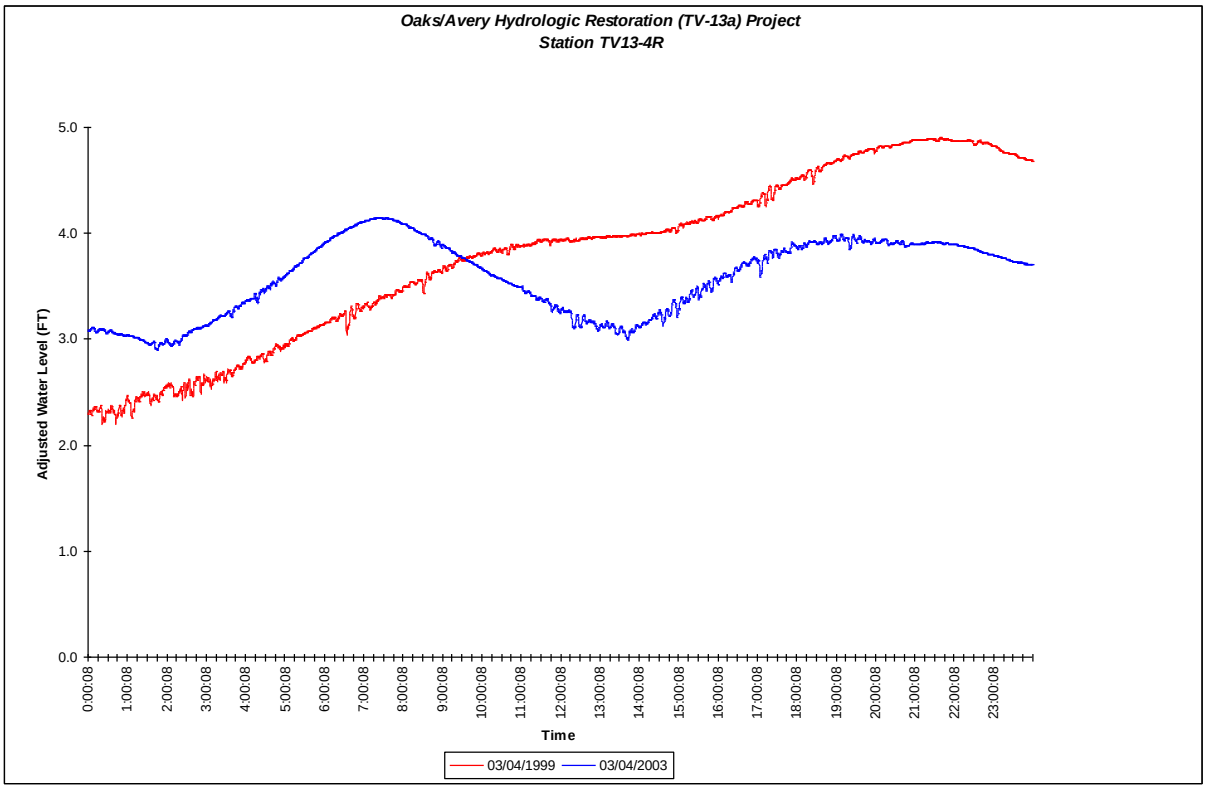


Figure 18. Relative daily water level data (feet) for 1999 and 2003 for Station TV13-4R.

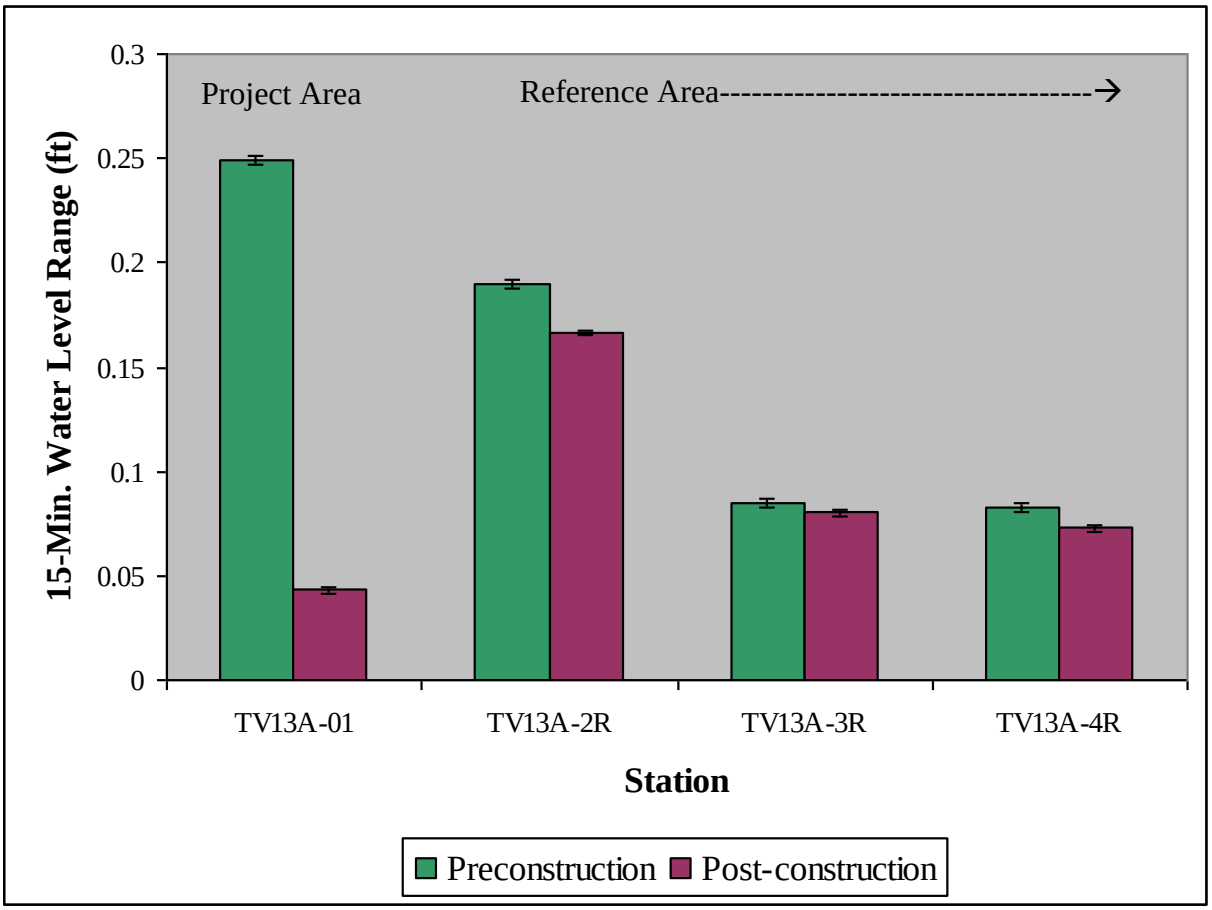
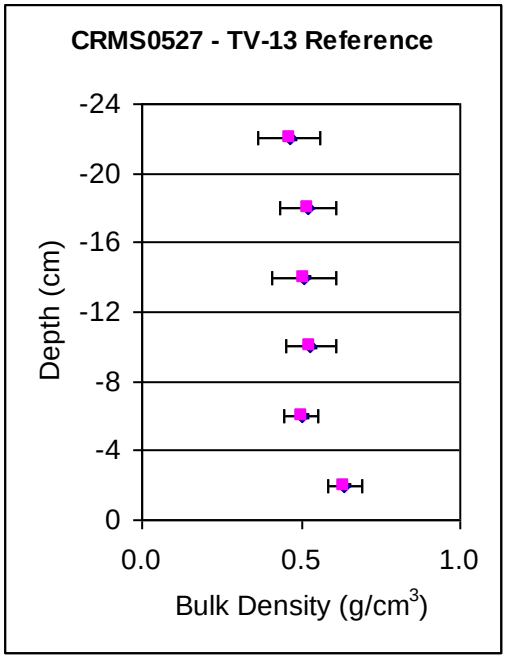
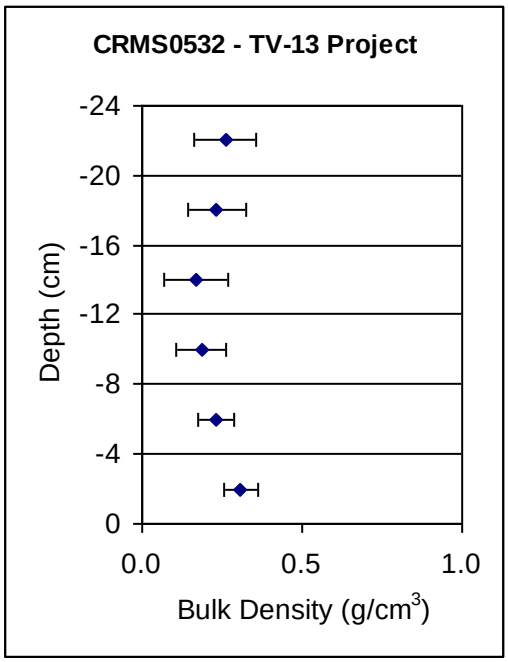
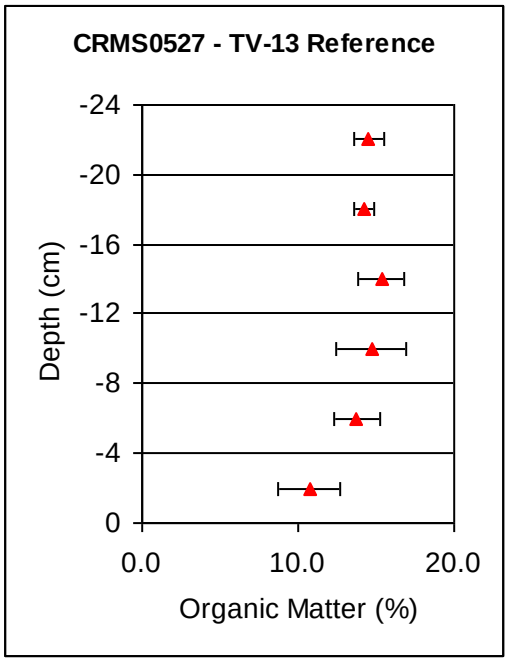


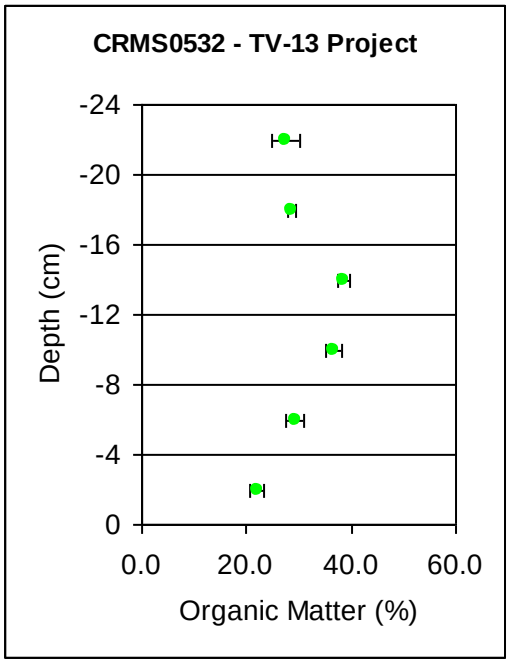
Figure 19. Relative daily water level variability (ft) both pre- and post-construction for the project and reference stations.





Figures 20a and 20b. Soil bulk density comparison of CRMS site 532 (project) and CRMS site 527 (reference).





Figures 21a and 21b. Soil organic matter content comparison of CRMS site 532 (project) and CRMS site 527 (reference).

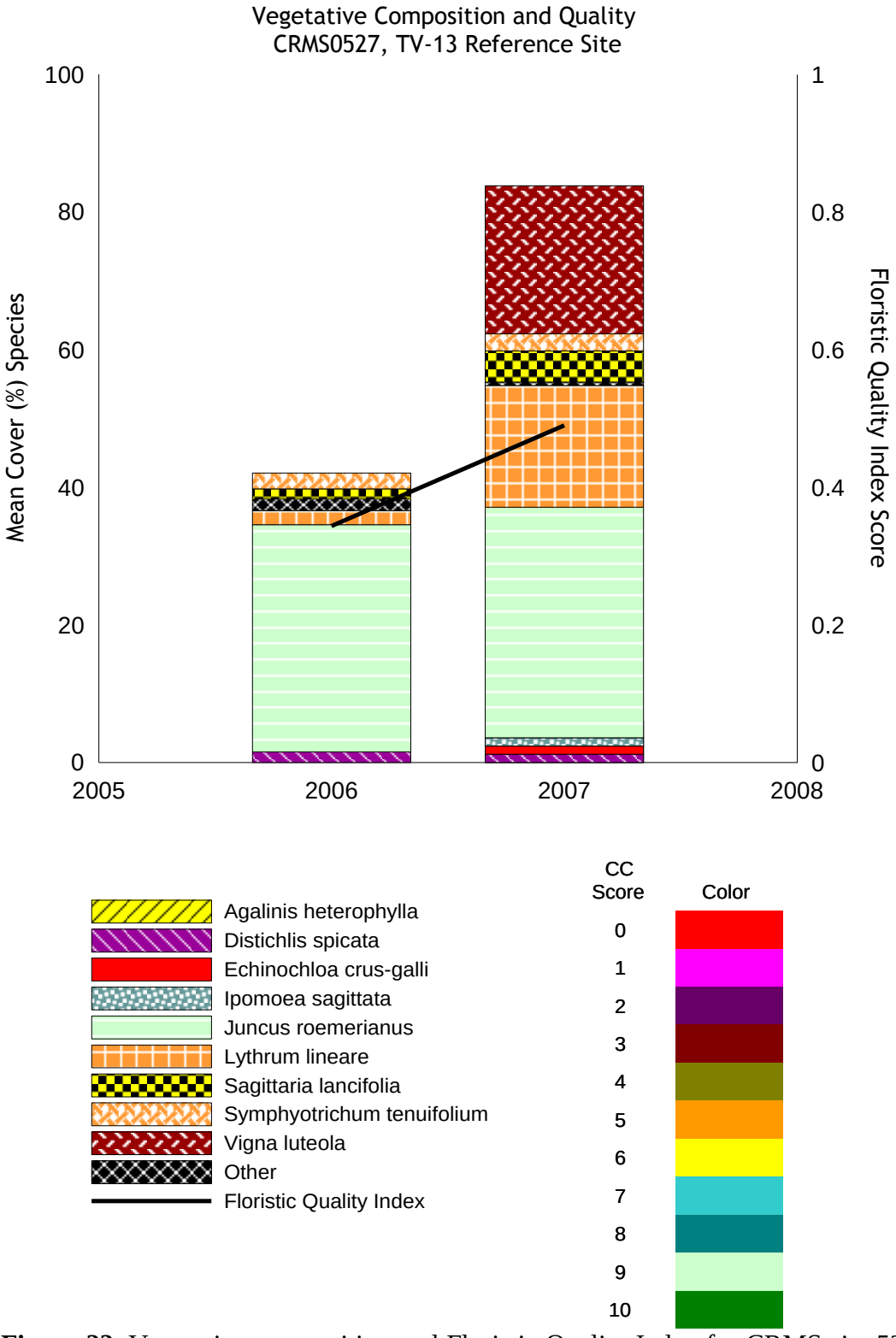


Figure 22. Vegetative composition and Floristic Quality Index for CRMS site 527 (reference site) since sampling began. Values are means of 10 stations within the site; therefore, the sum of percent coverage of individual species can be greater than 100 %.

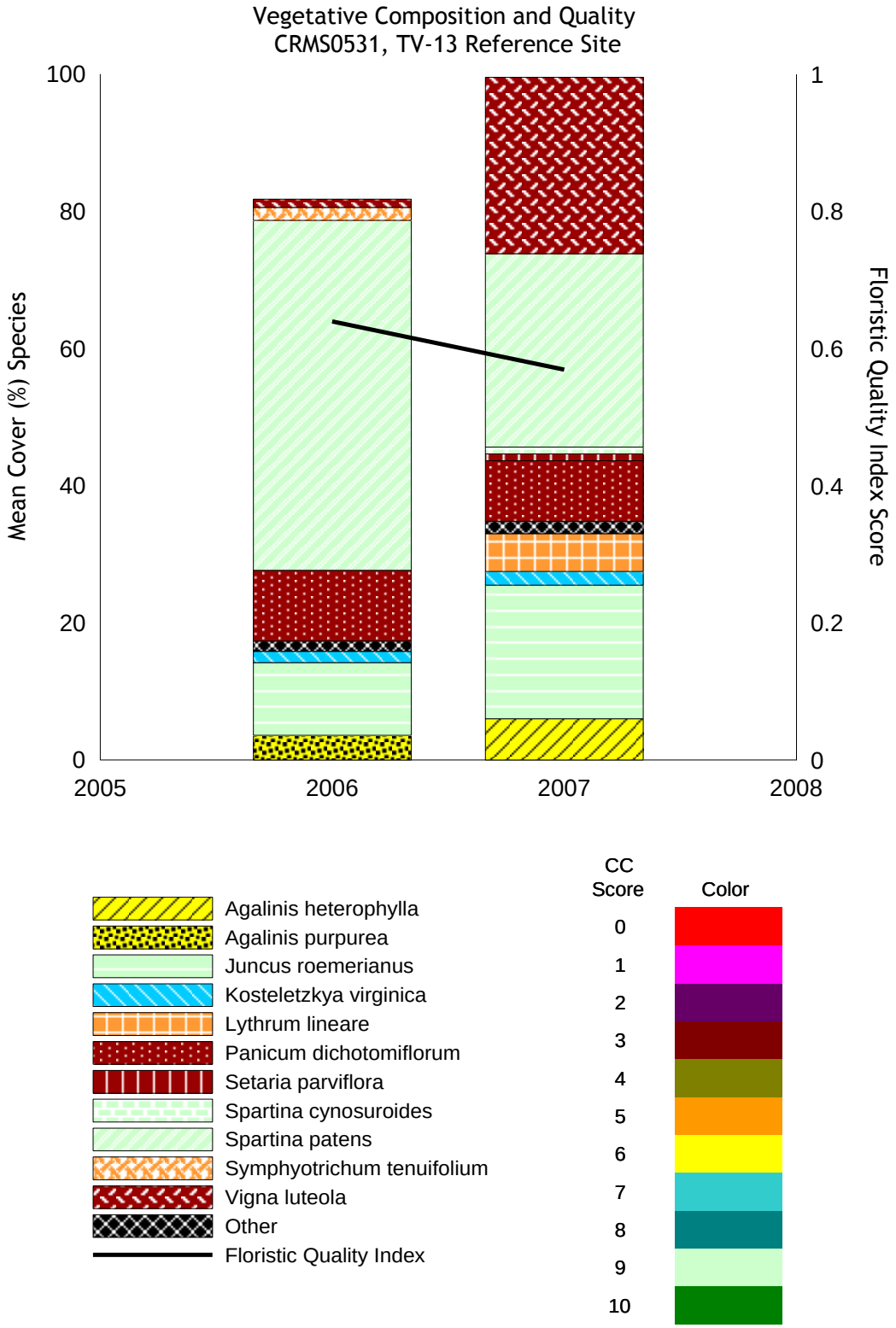


Figure 23. Vegetative composition and Floristic Quality Index for CRMS site 531 (reference site) since sampling began. Values are means of 10 stations within the site; therefore, the sum of percent coverage of individual species can be greater than 100 %.

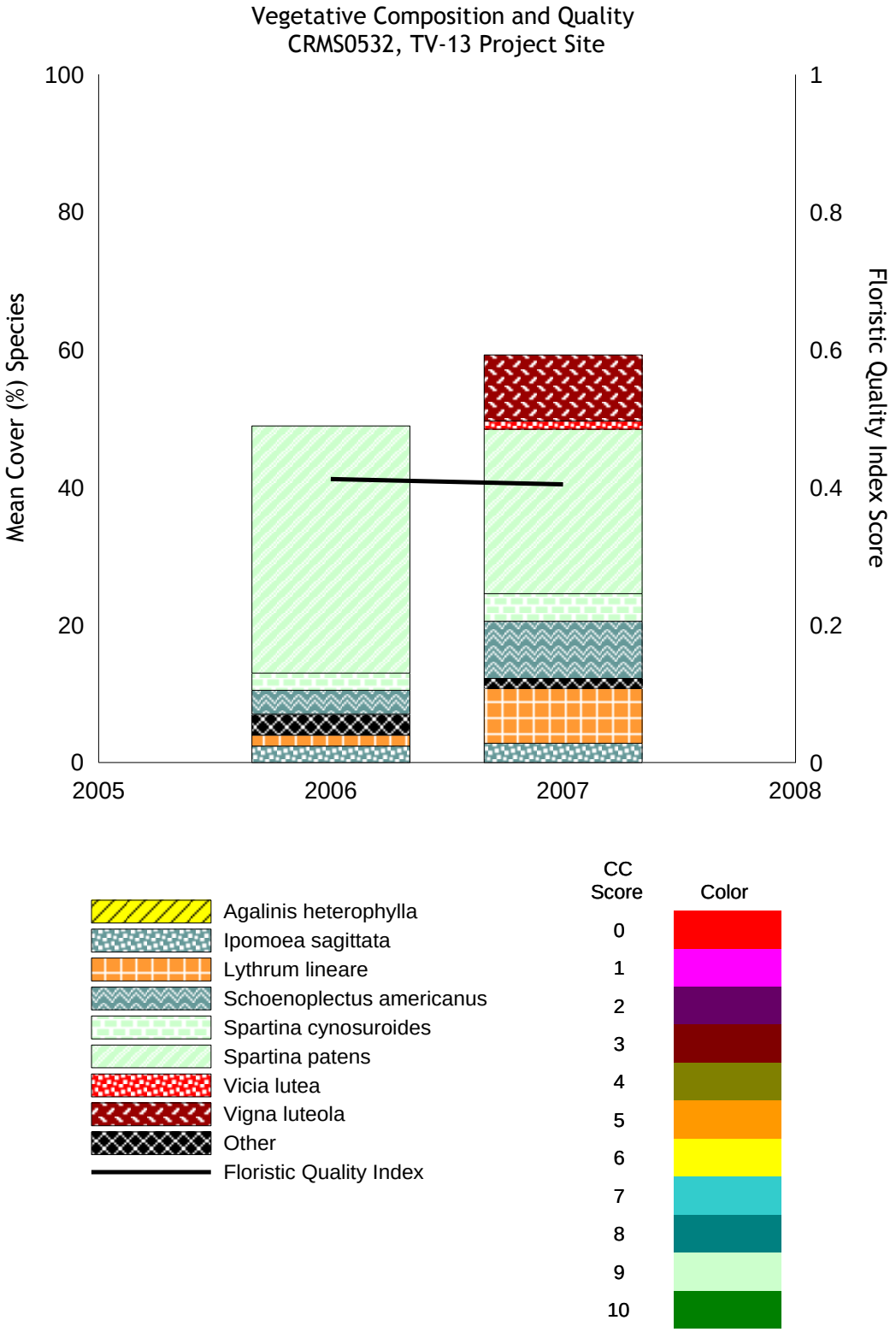


Figure 24. Vegetative composition and Floristic Quality Index for CRMS site 532 (project) since sampling began. Values are means of 10 stations within the site; therefore, the sum of percent coverage of individual species can be greater than 100 %.

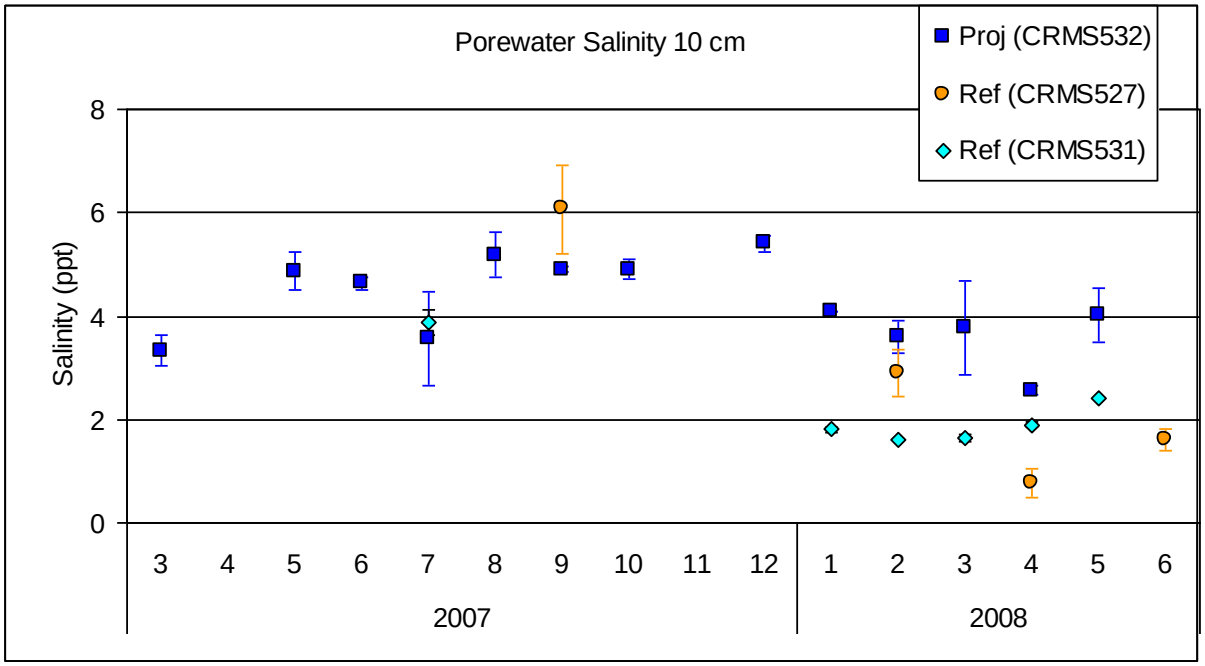


Figure 25. Soil porewater salinities for the three CRMS supplemental sites at the 10 cm depth for the period 2007-2008.

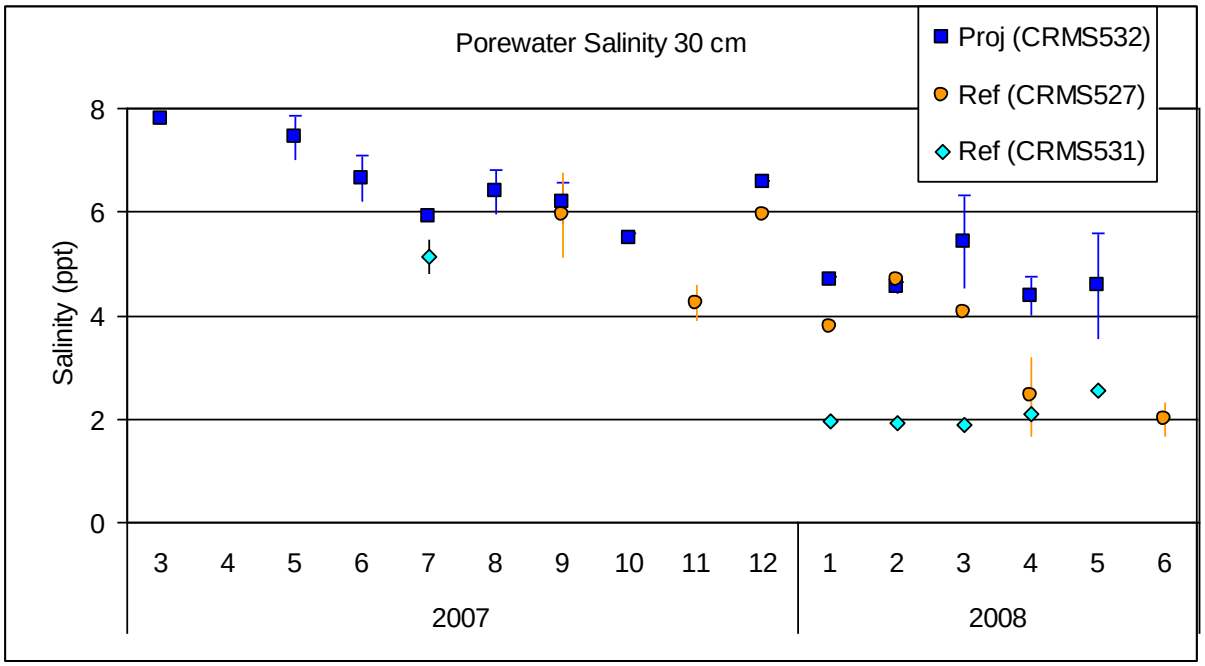


Figure 26. Soil porewater salinities for the three CRMS supplemental sites at the 30 cm depth for the period 2007-2008.

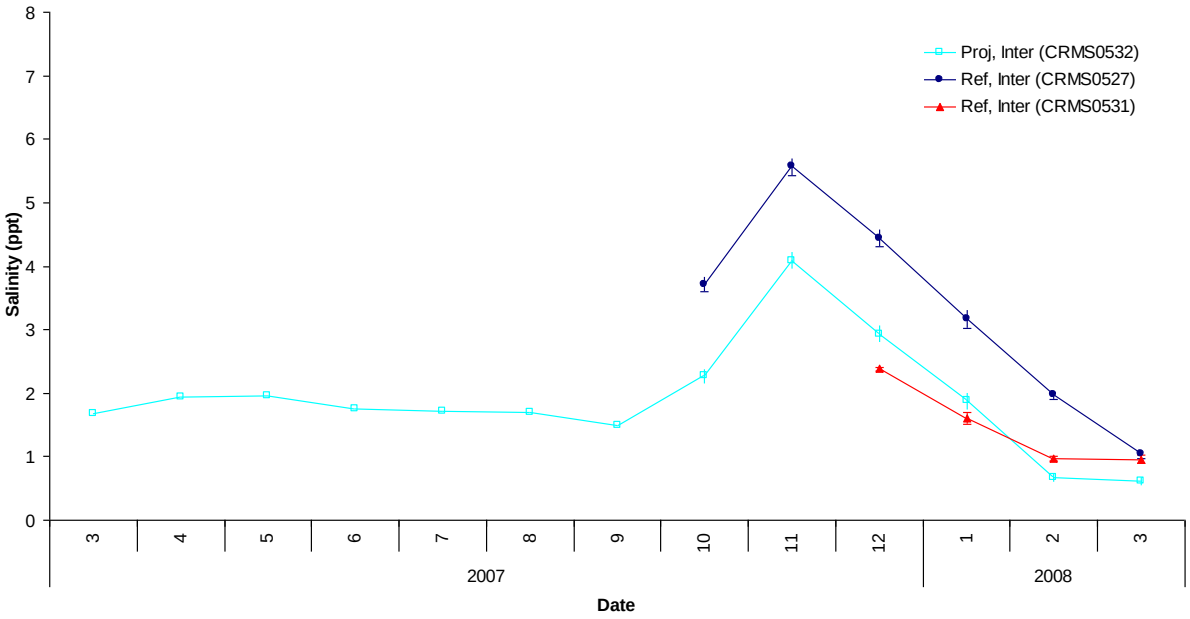


Figure 27. Monthly means of continuous salinity data for the three CRMS supplemental sites since data collection began.

V. Conclusions

a. Project Effectiveness

The project and reference area exhibited increased land loss during the period 2002-2006, most likely due to the effects of Hurricane Rita. The vegetative planting shoreline stabilization component of this project along Vermilion Bay resulted in minimal shoreline change over 80% of the project area from 2000-2003. The 6,000-ft section exhibiting the most loss is directly impacted by the predominantly southwest winds in the area and the loss of planted vegetation. Other portions of the shoreline have prograded slightly, and some portions experienced no change. It is possible that some short-term event, such as a strong storm, could have resulted in the loss of vegetation along this section of shoreline, facilitating the observed accelerated erosion. The passage of Hurricane Rita also contributed greatly to this accelerated shoreline loss. However, the current sampling interval cannot detect such short-term events. Shoreline erosion rates along Vermilion Bay increased during the period 2003-2007, again, most likely due to Hurricane Rita. At this time, the vegetative planting shoreline protection component of the project appears to be effective along the majority of the project shoreline, also indicated by the observation that the project did not lose any land area during the period 2000-2002.

For the rock dike component, shoreline change along the GIWW in the project area was evaluated for the period 2003-2007. Shoreline progradation occurred in the project area and slight loss occurred in the reference area, consistent with other rock dike projects. Visual observation indicated vertical accretion of the wetland area at many locations between the foreshore rock dike and the shoreline.

Water level variability was lower within the project area relative to the reference area following project construction. Water level variability in the project area since project construction has been reduced by approximately 80%. Prior to project construction, short-term water level variability in the project area was higher than the reference area. Following project construction, this water level variability in the project area was reduced drastically. The project thus far seems to be effective in reducing water level variability within the project area. Future analysis will provide information relative to the project's impacts on the sustainability of the vegetated wetlands in this area and the biological significance of this reduction in water level variability.

The CRMS supplemental data showed an increase in mean vegetative cover for all sites during the period 2006-2007, most likely the result of continued recovery from Hurricane Rita. Soils were more organic in the project area than the reference, possibly contributing to accelerated erosion rates along portions of the Vermilion Bay shoreline. Soil porewater salinities decreased with time, indicating a freshening effect as soils recovered from Hurricane Rita.

From an engineering standpoint, the Oaks/Avery Canals Hydrologic Restoration Project is in good condition. The situations discussed in the vegetative planting shoreline stabilization section regarding the bay shoreline breaches will be monitored but it is unlikely to be addressed with a maintenance project.

b. Recommended Improvements

Replanting vegetation or another suitable shoreline protection measure is strongly recommended for those portions of the Vermilion Bay shoreline exhibiting erosion rates in excess of 100 ft/yr. In addition, it is imperative to have a better understanding of the factors causing the observed shoreline loss in this area of the project.

c. Lessons Learned

VI. Literature Cited

Bourbaghs, M., Johnston, C.A., Regal, R.R., 2006. Properties and performance of the floristic quality index in Great Lakes coastal wetlands. Wetlands 26, 718-735.

Chabreck, R. H., and G. Linscombe 1968. Vegetative type map of the Louisiana coastal marshes. New Orleans: Louisiana Department of Wildlife and Fisheries. Scale 1:62,500.

_____. 1978. Vegetative type map of the Louisiana coastal marshes. New Orleans: Louisiana Department of Wildlife and Fisheries. Scale 1:62,500.

_____. 1988. Vegetative type map of the Louisiana coastal marshes. New Orleans: Louisiana Department of Wildlife and Fisheries. Scale 1:62,500.

Cohen, M.J., Carstenn, S., Lane, C.R., 2004. Floristic quality indices for biotic assessment of depressional marsh condition in Florida. Ecological Applications 14, 784-794.

Louisiana Department of Natural Resources – Coastal Restoration and Management Division, Coastal Engineering Division, and Coastal Restoration Division. 2004. *2004 Operations, Maintenance and Monitoring Report for Oaks-Avery Hydrologic Restoration Project (TV-13a).* Louisiana Department of Natural Resources, Coastal Restoration Division.

Mendelssohn, I. A., M. W. Hester, F. J. Monteferrante and F. Talbot 1991. Experimental dune building and vegetative stabilization in a sand-deficient barrier island setting on the Louisiana coast, USA. Journal of Coastal Research 7(1) :137-149.

Natural Resources Conservation Service 1998. Environmental Assessment, Oaks/Avery Canal Hydrologic Restoration Project, Vegetative Plantings. U. S. Department of Agriculture, Natural Resources Conservation Service, Iberia Parish, Louisiana. 5 pp.

O'Neil, T. 1949. Map of the southern part of Louisiana showing vegetation types of the Louisiana marshes. Louisiana Department of Wildlife and Fisheries New Orleans.

Steyer, G. D., and R. E. Stewart, Jr. 1992. Monitoring program for coastal wetlands planning, protection, and restoration acts projects. Open-file report no. 93-01. Lafayette, LA.: U.S. Geological Service, National Wetlands Center. 85 pp.

APPENDIX A
(Inspection Photographs)

Photo 1— rock dike on north bank of GIWW; west tie in

Photo 2—settled rock on north bank of GIWW at barge slip

Photo 3-- rock dike on north bank of GIWW; east tie in

Photo 4—east bank of Oaks Canal

Photo 5—west bank of Oaks Canal

Photo 6—cow path structure

Photo 7—landowner installed channel iron

Photo 8—landowner installed boat lifting device has been removed

Photo 9—earthen plug along levee

Photo 10—earthen plug along levee

Photo 11—rock plug

Photo 12- rock dike on south bank of GIWW, west tie-in

Photo 13- typical rock dike section along southern bank of GIWW

Photo 14- rock dike on south bank of GIWW, east tie-in

Photo 15- vegetation along shoreline west side of the Oaks Canal

APPENDIX B
(Three Year Budget Projection)

OAKS-AVERY HYDROLOGIC RESTORATION/ TV13a / PPL 6

Three-Year Operations & Maintenance Budgets 07/01/2008 - 06/30/2011

Project Manager	O & M Manager	Federal Sponsor	Prepared By
Pat Landry	*Darrell Pontiff*	*NRCS*	*Darrell Pontiff*

	2008/2009	2009/2010	2010/2011
Maintenance Inspection	$ 5,570.00	$ 5,737.00	$ 5,909.00
Structure Operation		$ -	$ -
Administration		$ -	$ -
Maintenance/Rehabilitation			

08/09 Description: Add staff gage at Cow Path Structure

E&D	$7,500.00
Construction	
Construction Oversight	
Sub Total - Maint. And Rehab.	$ 7,500.00

09/10 Description

E&D	$ -
Construction	$ -
Construction Oversight	$ -
Sub Total - Maint. And Rehab.	$ -

10/11 Description:

E&D	$ -
Construction	$ -
Construction Oversight	$ -
Sub Total - Maint. And Rehab.	$ -

	2008/2009	2009/2010	2010/2011
Total O&M Budgets	**$ 13,070.00**	**$ 5,737.00**	**$ 5,909.00**

O &M Budget (3 yr Total)	**$ 24,716.00**
Unexpended O & M Budget	**$ 266,288.24**
Remaining O & M Budget (Projected)	**$ 241,572.24**

OPERATION AND MAINTENANCE BUDGET 07/01/2008-06/30/2009

OAKS/AVERY HR/TV-13a/PPL6

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	$5,570.00	**$5,570.00**
General Structure Maintenance	LUMP	1	$0.00	**$0.00**
Engineering and Design	LUMP	1	$0.00	**$0.00**
Operations Contract	LUMP	1	$0.00	**$0.00**
Construction Oversight	LUMP	1	$0.00	**$0.00**

ADMINISTRATION

LDNR / CRD Admin.	LUMP	0	$0.00	$0.00
FEDERAL SPONSER Admin.	LUMP	0	$0.00	$0.00
SURVEY Admin.	LUMP	0	$0.00	$0.00
OTHER				$0.00
			TOTAL ADMINISTRATION COSTS:	**$0.00**

MAINTENANCE / CONSTRUCTION

SURVEY

SURVEY DESCRIPTION:	Add staff gage at Cow Path Structure				
	Secondary Monument	EACH	0	$0.00	$0.00
	Staff Gauge / Recorders	EACH	1	$7,500.00	$7,500.00
	Marsh Elevation / Topography	LUMP	0	$0.00	$0.00
	TBM Installation	EACH	0	$0.00	$0.00
	OTHER				$0.00
				TOTAL SURVEY COSTS:	**$7,500.00**

GEOTECHNICAL

GEOTECH DESCRIPTION:					
	Borings	EACH	0	$0.00	$0.00
	OTHER				$0.00
				TOTAL GEOTECHNICAL COSTS:	**$0.00**

CONSTRUCTION

CONSTRUCTION DESCRIPTION:					
Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE	
	0	0.0	0	$0.00	$0.00
	0	0.0	0	$0.00	$0.00
	0	0.0	0	$0.00	$0.00
Filter Cloth / Geogrid Fabric		SQ YD	0	$0.00	$0.00
Navagation Aid		EACH	0	$0.00	$0.00
Signage		EACH	0	$0.00	$0.00
General Excavation / Fill		CU YD	0	$0.00	$0.00
Dredging		CU YD	0	$0.00	$0.00
Sheet Piles (Lin Ft or Sq Yds)			0	$0.00	$0.00
Timber Piles (each or lump sum)			0	$0.00	$0.00
Timber Members (each or lump sum)			0	$0.00	$0.00
Hardware		LUMP	1	$0.00	$0.00
Materials		LUMP	1	$0.00	$0.00
Mob / Demob		LUMP	1	$0.00	$0.00
Contingency		LUMP	1	$0.00	$0.00
General Structure Maintenance		LUMP	1	$0.00	$0.00
OTHER				$0.00	$0.00
OTHER				$0.00	$0.00
OTHER				$0.00	$0.00
				TOTAL CONSTRUCTION COSTS:	**$0.00**

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **$13,070.00**

OPERATION AND MAINTENANCE BUDGET 07/01/2009-06/30/2010

OAKS/AVERY HR/TV-13a/PPL6

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	$5,737.00	**$5,737.00**
General Structure Maintenance	LUMP	1	$0.00	**$0.00**
Engineering and Design	LUMP	1	$0.00	**$0.00**
Operations Contract	LUMP	1	$0.00	**$0.00**
Construction Oversight	LUMP	1	$0.00	**$0.00**

ADMINISTRATION

LDNR / CRD Admin.	LUMP	0	$0.00	$0.00
FEDERAL SPONSER Admin.	LUMP	0	$0.00	$0.00
SURVEY Admin.	LUMP	0	$0.00	$0.00
OTHER				$0.00
			TOTAL ADMINISTRATION COSTS:	**$0.00**

MAINTENANCE / CONSTRUCTION

SURVEY

SURVEY DESCRIPTION:					
Secondary Monument		EACH	0	$0.00	$0.00
Staff Gauge / Recorders		EACH	0	$0.00	$0.00
Marsh Elevation / Topography		LUMP	0	$0.00	$0.00
TBM Installation		EACH	0	$0.00	$0.00
OTHER					$0.00
				TOTAL SURVEY COSTS:	**$0.00**

GEOTECHNICAL

GEOTECH DESCRIPTION:					
Borings		EACH	0	$0.00	$0.00
OTHER					$0.00
				TOTAL GEOTECHNICAL COSTS:	**$0.00**

CONSTRUCTION

CONSTRUCTION DESCRIPTION:					
Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE	
	0	0.0	0	$0.00	$0.00
	0	0.0	0	$0.00	$0.00
	0	0.0	0	$0.00	$0.00
Filter Cloth / Geogrid Fabric		SQ YD	0	$0.00	$0.00
Navagation Aid		EACH	0	$0.00	$0.00
Signage		EACH	0	$0.00	$0.00
General Excavation / Fill		CU YD	0	$0.00	$0.00
Dredging		CU YD	0	$0.00	$0.00
Sheet Piles (Lin Ft or Sq Yds)			0	$0.00	$0.00
Timber Piles (each or lump sum)			0	$0.00	$0.00
Timber Members (each or lump sum)			0	$0.00	$0.00
Hardware		LUMP	1	$0.00	$0.00
Materials		LUMP	1	$0.00	$0.00
Mob / Demob		LUMP	1	$0.00	$0.00
Contingency		LUMP	1	$0.00	$0.00
General Structure Maintenance		LUMP	1	$0.00	$0.00
OTHER				$0.00	$0.00
OTHER				$0.00	$0.00
OTHER				$0.00	$0.00
				TOTAL CONSTRUCTION COSTS:	**$0.00**

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **$5,737.00**

OPERATION AND MAINTENANCE BUDGET 07/01/2010-06/30/2011

OAKS/AVERY HR/TV-13a/PPL6

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	$5,909.00	**$5,909.00**
General Structure Maintenance	LUMP	1	$0.00	**$0.00**
Engineering and Design	LUMP	1	$0.00	**$0.00**
Operations Contract	LUMP	1	$0.00	**$0.00**
Construction Oversight	LUMP	1	$0.00	**$0.00**

ADMINISTRATION

LDNR / CRD Admin.	LUMP	1	$0.00	$0.00
FEDERAL SPONSER Admin.	LUMP	1	$0.00	$0.00
SURVEY Admin.	LUMP	1	$0.00	$0.00
OTHER				$0.00
			TOTAL ADMINISTRATION COSTS:	**$0.00**

MAINTENANCE / CONSTRUCTION

SURVEY

SURVEY DESCRIPTION:					
Secondary Monument		EACH	0	$0.00	$0.00
Staff Gauge / Recorders		EACH	0	$0.00	$0.00
Marsh Elevation / Topography		LUMP	0	$0.00	$0.00
TBM Installation		EACH	0	$0.00	$0.00
OTHER					$0.00
				TOTAL SURVEY COSTS:	**$0.00**

GEOTECHNICAL

GEOTECH DESCRIPTION:					
Borings		EACH	0	$0.00	$0.00
OTHER					$0.00
				TOTAL GEOTECHNICAL COSTS:	**$0.00**

CONSTRUCTION

CONSTRUCTION DESCRIPTION:					
Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE	
	0	0.0	0	$0.00	$0.00
	0	0.0	0	$0.00	$0.00
	0	0.0	0	$0.00	$0.00
Filter Cloth / Geogrid Fabric		SQ YD	0	$0.00	$0.00
Navagation Aid		EACH	0	$0.00	$0.00
Signage		EACH	0	$0.00	$0.00
General Excavation / Fill		CU YD	0	$0.00	$0.00
Dredging		CU YD	0	$0.00	$0.00
Sheet Piles (Lin Ft or Sq Yds)			0	$0.00	$0.00
Timber Piles (each or lump sum)			0	$0.00	$0.00
Timber Members (each or lump sum)			0	$0.00	$0.00
Hardware		LUMP	1	$0.00	$0.00
Materials		LUMP	1	$0.00	$0.00
Mob / Demob		LUMP	1	$0.00	$0.00
Contingency		LUMP	1	$0.00	$0.00
General Structure Maintenance		LUMP	1	$0.00	$0.00
OTHER				$0.00	$0.00
OTHER				$0.00	$0.00
OTHER				$0.00	$0.00
				TOTAL CONSTRUCTION COSTS:	**$0.00**

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **$5,909.00**

APPENDIX C
(Field Inspection Notes)

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspection: April 24, 2008 Time: 10:05 am

Structure No. N/A

Inspector(s): Stan Aucoin, Mel Guidry, Troy Barrilleaux(OCPR) Darrell Pontiff (OCPR), Dale Garber (NRCS)

Structure Description: rock dike along northern bank of GIWW

Water Level

Type of Inspection: Annual

Weater Conditions: partly cloudy and mild

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap/dike	Excellent			1-3	Dike is excellent post construction condition. Approx. 60 LF on eastern end hit by barge continues to settle.
Eathern Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspection: April 24, 2008 Time: 10:24 am

Structure No. N/A

Inspector(s): Stan Aucoin, Mel Guidry, Troy Barrilleaux(OCPR) Darrell Pontiff (OCPR), Dale Garber (NRCS)

Structure Description: rock paving at Oaks Canal

Water Level

Type of Inspection: Annual

Weater Conditions: partly cloudy and mild

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	Excellent			4 & 5	Rock in excellent condition
Eathern Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspection: April 24, 2008 Time: 10:35 am

Structure No. Cowpath Structure

Inspector(s): Stan Aucoin, Mel Guidry, Troy Barrilleaux(OCPR)
Darrell Pontiff (OCPR), Dale Garber (NRCS)

Structure Description: Fixed crest weir

Water Level

Type of Inspection: Annual

Weater Conditions: partly cloudy and mild

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Excellent			7	
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	Good			8	Three SS bolts missing from pile cap. Not critical. Landowner installed boat lifting device has been removed..
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	Excellent				
Vegetation	N/A				
Signage /Supports	Excellent			6	
Rip Rap (fill)	N/A				
Eathern Embankment	Excellent				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspection: April 24, 2008 Time: 10:55 am

Structure No. N/A

Inspector(s): Stan Aucoin, Mel Guidry, Troy Barrilleaux(OCPR) Darrell Pontiff (OCPR), Dale Garber (NRCS)

Structure Description: Earthen closures

Water Level

Type of Inspection: Annual

Weater Conditions: partly cloudy and mild

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	N/A				
Eathern Embankment	Excellent			9-10	

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspection: April 24, 2008 Time: 11:00 am

Structure No. N/A

Inspector(s): Stan Aucoin, Mel Guidry, Troy Barrilleaux(OCPR) Darrell Pontiff (OCPR), Dale Garber (NRCS)

Structure Description: Rock plug

Water Level

Type of Inspection: Annual

Weater Conditions: partly cloudy and mild

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	Excellent			11	
Eathern Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspection: April 24, 2008 Time: 11:05 am

Structure No. N/A

Inspector(s): Stan Aucoin, Mel Guidry, Troy Barrilleaux(OCPR) Darrell Pontiff (OCPR), Dale Garber (NRCS)

Structure Description: Rock breakwater along southern bank of GIWW

Water Level

Type of Inspection: Annual

Weater Conditions: partly cloudy and mild

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	Excellent			12, 13, 14	
Eathern Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspection: April 24, 2008 Time: 11:10 am

Structure No. N/A

Inspector(s): Stan Aucoin, Mel Guidry, Troy Barrilleaux(OCPR) Darrell Pontiff (OCPR), Dale Garber (NRCS)

Structure Description: Shoreline vegetation

Water Level

Type of Inspection: Annual

Weater Conditions: partly cloudy and mild

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	Good			15	Only vegetation inspected was along either side of the mouth of the Oaks Canal.
Signage /Supports	N/A				
Rip Rap (fill)	N/A				
Earthen Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticeable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?