



State of Louisiana

**Coastal Protection and Restoration
Authority (CPRA)**

**2015 Operations,
Maintenance,
and Monitoring Report**

for

**Freshwater Introduction South of
Highway 82**

State Project Number ME-16
Priority Project List 9

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Calcasieu Parish

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For
Freshwater Introduction South of Highway 82 (ME-16)

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Preface

This report includes monitoring data collected through December 2014, and the annual maintenance inspection from May 2015. The Freshwater Introduction South of LA Hwy 82 (ME-16) project is a 20-year Coastal Wetlands, Planning, Protection, and Restoration Act (CWPPRA, Public Law 101-646, Title III, Priority List 9) project administered by the United States Fish and Wildlife Service (USFWS) and the Coastal Protection and Restoration Authority of Louisiana (CPRA).

The 2015 report is the 3rd in a series of reports. For additional information on lessons learned, recommendations and project effectiveness please refer to the 2004, 2007, and 2011 Operations, Maintenance, and Monitoring Reports on the CPRA web site at <http://coastal.Louisiana.gov/>. These reports will be made available for download at the following website: <http://cims.coastal.la.gov/>.

I. Introduction

The Freshwater Introduction South of LA Hwy 82 project area is located in the central and eastern portions of Rockefeller State Wildlife Refuge, and Miami Corporation on the eastern end of the Grand Chenier ridge, approximately 10 miles (16.09 km) east of the community of Grand Chenier in Cameron and Vermilion Parishes, La (Figure 1). It is bounded to the west by a canal west of Little Constance Bayou south of Deep Lake, to the south by the Gulf shoreline of the unmanaged marsh south of Unit 6, to the east by Rollover Bayou to a line from Flat Lake to the western boundary of Unit 15 and to the north by Louisiana LA Hwy 82. The project will benefit some 19,988 acres (8,088.87 ha) of which 15,835 acres (6,408.21 ha) are marsh and the remaining 4,153 acres (1,680.66 ha) are open water (USGS 1999).

The “Lakes” subbasin of the Mermentau Basin is experiencing high water levels (>2 ft MLG) due to the existence of locks and gates that control water levels and prevent saltwater intrusion into Grand and White Lakes. The “Chenier” subbasin of the Mermentau Basin is experiencing saltwater intrusion due to lack of freshwater flow caused by the presence of the hydrologic barriers consisting of LA Hwy 82 and the Lakes subbasin gates and locks. Marsh loss is occurring in the Chenier subbasin due to saltwater intrusion and in the Lakes subbasin due to high freshwater water levels which stress *Spartina patens* (marshhay cordgrass) and certain fresh marsh species and cause increased shoreline erosion along White Lake and Grand Lake (Clark 1999).

Most of the soils in the project area are classified as either Clovelly muck, Scatlake mucky clay or Bancker muck, which are level, poorly drained fluid soils (U.S. Department of Agriculture [USDA] 1995). Clovelly muck and Bancker muck are organic and mineral soils respectively, found in brackish marsh, whereas Scatlake mucky clay, prevalent at the southern end of the project area, is a mineral soil found in saline marshes.

The habitats in the project and adjacent areas are brackish and intermediate emergent marsh with saline marsh along the edge of the Gulf of Mexico (Chabreck et al., 1968, Chabreck and Linscombe, 1978, 1988). Dominant emergent vegetation species present in and adjacent to



the project include *Spartina patens* (marshhay cordgrass), *Schoenoplectus americanus* (chairmaker's bullrush), *Distichlis spicata* (inland saltgrass), *Phragmites australis* (Roseau cane) and *Schoenoplectus robustus* (leafy three-square) (USDA-NRCS 2002).

The project is co-sponsored by the United States Fish and Wildlife Service (USFWS) and the Coastal Protection and Restoration Authority (CPRA) and is designed to move water from Grand and White Lakes (when adequate head differential exists) to marsh areas south of LA Hwy 82, in order to moderate elevated salinities in Areas A, B and C. In addition 14 acres (5.67 ha) of marsh were created through the construction of terraces in Area B (Figure 1).

A model was prepared by Fenstermaker and Associates and a report was submitted to evaluate the effects of the project (C.H. Fenstermaker and Associates [CHFA] 2003). The modeling software used was MIKE 11, a one-dimensional model used for simulating flows, sediment transport, and water quality in estuaries, rivers, irrigation systems, and similar water bodies. The model showed that, overall, the project would reduce salinities in Area A. The magnitude of salinity reduction varied from each location with variances from 1-2 ppt to 3-4 ppt. The flap gates of the proposed structures at Little Constance Bayou, Dyson Bayou, Cop Cop Bayou, and structures No. 10 and 12 in the Boundary Line Levee should protect Unit 6 and Areas B and C from salinity spikes.

The construction phase of the project consisted of the following components:

1. The borrow canal along Hwy 82 and the trenasse connecting Superior Canal to the borrow canal was widened and deepened.
2. The Grand Volle Ditch was widened and deepened on both sides of Hwy 82 and a conveyance channel was constructed into Grand Volle Lake from Grand Volle Ditch. A barricade was also placed at the intersection of Grand Volle Ditch and Grand Volle Lake
3. Approximately 26,000 linear ft of vegetated "duck-wing" terraces were constructed in the shallow open water between Units 6 and 14.
4. The plug in the Superior Canal branch that forms the eastern boundary of Rockefeller Refuge Unit 13 at the NE portion of Unit 13/Unit 6 Boundary line canal was removed.
5. The existing Little Constance Bayou water control structure was replaced with 4 – 4' - 8" X 6' - 8" flap gates on the south side and stop logs on the north side.
6. A new structure with four 48 in diameter culverts with flapgates and stoplogs was installed north of the existing Dyson Bayou structure near the NW portion of a small lake in the Unit 6 Boundary Line levee.
7. A new structure with four 48 in diameter culverts with flapgates and stoplogs was installed near the plugged Cop Cop Bayou adjacent to the existing Cop Cop Bayou structure.
8. Two new structures (10 and 12) with three 48 in diameter culverts with flapgates and stoplogs were installed in the Boundary Line Levee south of Unit 14.
9. The existing boundary line channel near the Cameron-Vermilion Parish line was widened and deepened.

Construction of the project features was completed in October 2006.



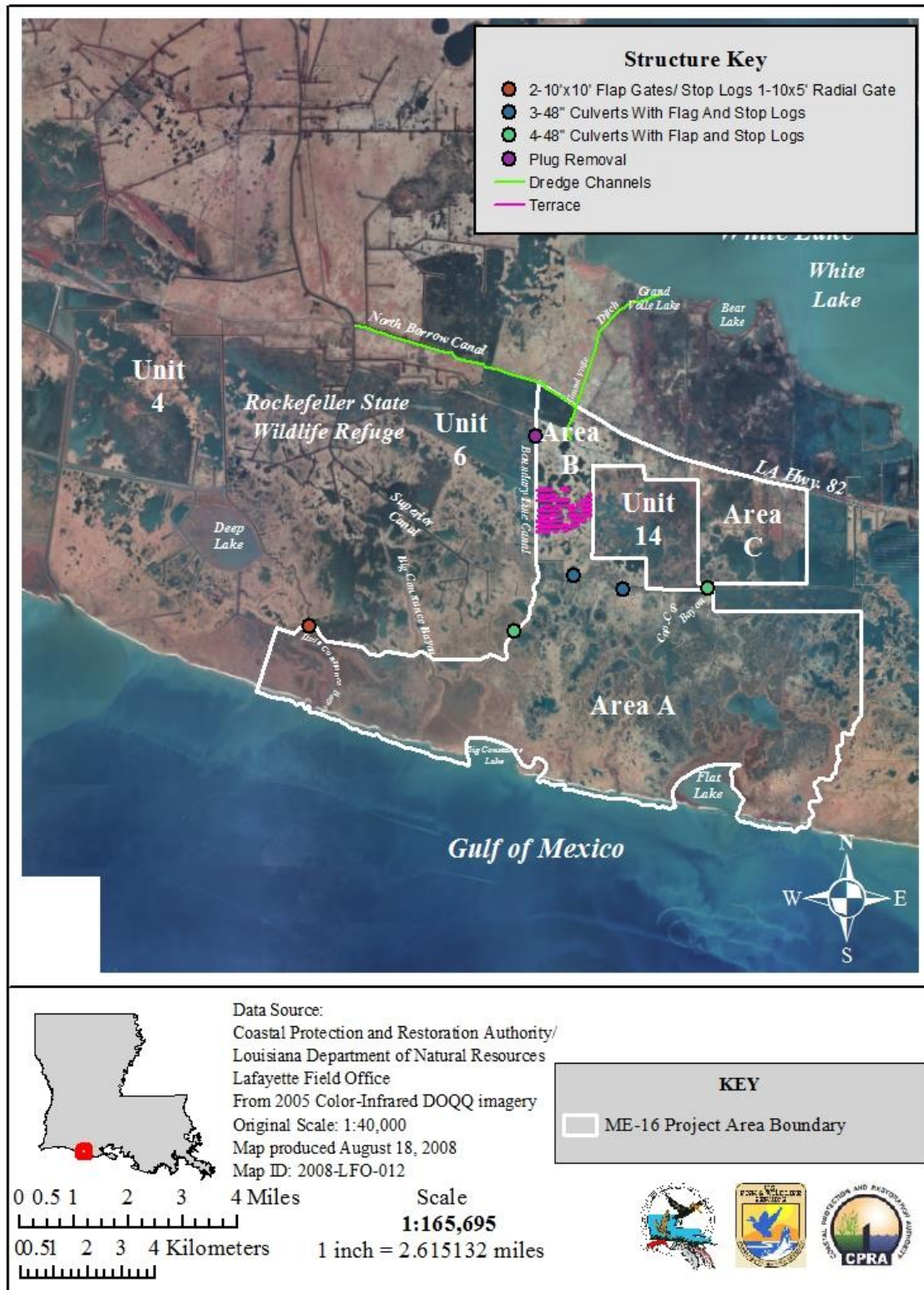


Figure 1. Freshwater Introduction South of Hwy 82 (ME-16) project area and construction features.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Freshwater Introduction South of Highway 82 Project (ME-16) 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, CPRA 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. 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 Freshwater Introduction South of Hwy 82 Project (ME-16) was held on October 28, 2014 under cloudy skies and cool temperatures. In attendance were Dion Broussard and Mark Mouledous of CPRA; Darryl Clark of USFWS; Darren Richard of LDWF. All parties met at the boat launch on the northern end of Unit 14 at LA Hwy 82. The annual inspection began at approximately 9:30 a.m.

The field inspection included a complete visual inspection of all project features. Staff gage readings and existing temporary benchmarks where available were used to determine approximate elevations of water, earthen terraces, rock dike, 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

New Cop-Cop Structure

The structure is in good condition. Rock revetment looks good. (Photos: Appendix A, Photos 1 & 2)

Perry Bayou Structure (Formerly Structure No. 12)

Overall this structure is in good condition. Rock revetment looks good. (Photos: Appendix A, Photo 3 & 4)

McNeese Bayou Structure (Structure No. 10)

Overall this structure is in good condition. Rock revetment looks good. (Photos: Appendix A, Photo 5 & 6)



Earthen Terraces

The terrace field is in very good condition. The vegetation is healthy and there appears to be little erosion. (Photos: Appendix A, Photo 11 & 12)

Grand Volle South Channel Enlargement

This area was not inspected during this field trip.

Hess' Cut (Formerly New Dyson Structure)

Overall this structure is in good condition. Rock revetment looks good. (Photos: Appendix A, Photo 7 & 8)

Little Constance Structure

Overall this structure is in good condition. Rock revetment looks good. (Photos: Appendix A, Photo 9 & 10)

Louisiana Highway 82 Channel Enlargement

This area was not inspected during this field trip.

Grand Volle North Channel Enlargement and Marine Barrier

This area was not inspected during this field trip.

Boundary Line Channel Enlargement and Earthen Plug Removal

This area was not inspected during this field trip.

c. Maintenance Recommendations

- i. Immediate/ Emergency Repairs**
No immediate repairs required at this time.
- ii. Programmatic/ Routine Repairs**
No maintenance work required at this time.

d. Maintenance History

General Maintenance: Below is a summary of completed maintenance projects and operation tasks performed since December 2006, the construction completion date of the Freshwater Introduction South of Hwy 82 Project (ME-16).



2011 – Hurricane Ike Repairs to New Cop Cop, Structure 12, Structure 10, New Dyson, and Little Constance water control structures – B & J Marine Services – This maintenance project included placing rock revetment at all five water control structures within the project boundary.

- New Cop Cop – approximately 94 tons of rip rap placed
- Structure 12 – approximately 377 tons of rip rap placed
- Structure 10 – approximately 159 tons of rip rap placed
- New Dyson – approximately 198 tons of rip rap placed
- Little Constance – approximately 467 tons of rip rap placed

At the time of construction, the contractor uncovered sinkholes above pipes at the New Cop Cop and New Dyson structures. The sinkholes were created by water infiltrating through breeches in the seal between the pipe and headwall. A change order was issued and the contractor repaired the breeches by excavating soil around the pipe, sealing the pipe and headwall with Wet Dry 700 and redi-mix concrete, and then backfilling.

This maintenance project was a result of damages sustained from Hurricane Ike's storm surge in September 2008. The state was reimbursed for this maintenance project by FEMA in 2011.

| | |
|---|---------------------|
| Construction Costs | \$300,484.44 |
| Engineering and Design, Construction Oversight | \$79,202.27 |
| Total Cost | \$379,686.71 |

III. Operation Activity

a. Operation Plan

| Operation Plan Control Structure | Structure Type | Area Controlled | Salinity Target Level | Water Target Level | Operation |
|--|---|----------------------------------|---|---|---|
| Little Constance Control Structure Note: no change to Big Constance Structure | Existing structure modified from 3 - 10 ft wide X 8 ft deep radial arm gates to flapgates on the south side and stoplogs on the north side. | Unit 6 and Area A Unmanaged-unit | 5/10 ppt @ Superior Canal-Hwy 82 Bridge | 3" below marsh level (0.75 feet NAVD88) | <u>Maintenance</u> – All flapgates open and stop logs removed when target levels not exceeded. <u>Salinity Target</u> – 2 bays closed (i.e., flapgates lowered) when 5 ppt salinity target level reached, stoplogs removed; all bays closed (all 3 flapgates lowered) when 10 ppt salinity reached, stoplogs removed. <u>Water Level Target</u> – Stoplogs set at marsh level to 0.5 feet below marsh level when water levels reach target levels (3 inches BML or 0.75 ft NAVD88) or less. |
| Existing Dyson Bayou and Bayou Josephine WCSs | 4 – 48 inch diameter culverts with flapgates on south and stop logs on north (Unit 6) side. | Unit 6 and Area A | 5/10 ppt @ Superior Canal-Hwy 82 Bridge | 3" below marsh level (0.75 feet NAVD88) | <u>Maintenance</u> – All gates flapping, stop logs at 2 ft below marsh level <u>Water Level Target</u> – Stop logs set at marsh level to 0.5 ft below marsh level when water levels approach target levels (0.75 ft NAVD88) @ Superior Canal. |
| New Dyson Bayou WCS | 4 – 48 inch diameter culverts with flapgates on south and stop logs on north (Unit 6) side. | Unit 6 and Area A | 5/10 ppt @ Superior Canal-Hwy 82 Bridge | 3" below marsh level (0.75 feet NAVD88) | <u>Maintenance</u> – All gates flapping, stop logs at 2 ft below marsh level <u>Water Level Target</u> – Stop logs set at marsh level to 0.5 ft below marsh level (1.0 ft to 0.5 ft) when water levels approach target levels (0.75 ft NAVD88) @ Superior Canal. |
| Existing Cop-Cop Bayou WCS | 4 – 48 inch diameter culverts with flapgates on south and stop logs on north side. | Area A and Areas B and C | 6 ppt @ Area A at Unit 14 station | 3" below marsh level (0.75 feet NAVD88) | <u>Maintenance</u> – All gates flapping, stop logs at 2 ft below marsh level <u>Ingress Period</u> (May-June) – Flapgates raised; Stop logs at 2 ft below marsh level or lower <u>Water Level Target</u> – Stop logs set at marsh level to 0.5 ft below marsh level (1.0 ft to 0.5 ft) when water levels approach target levels (0.75 ft NAVD88) @ Superior Canal. |
| New Cop-Cop Bayou, New Structures 10 and No. 12 WCS | 4 – 48 inch diameter culverts with flapgates on south and stop logs on north side. | Area A and Areas B and C | 6 ppt @ Area A at Unit 14 station | 3" below marsh level (0.75 feet NAVD88) | <u>Maintenance (Always)</u> – All gates flapping, stop logs at 2 ft or greater below marsh level <u>Water Level Target</u> – Stop logs set at marsh level to 0.5 ft below marsh level (1.0 ft to 0.5 ft) when water levels approach target levels (0.75 ft NAVD88) @ Superior Canal. |

Note: The above operational plan submitted by Darryl Clark with USFWS.

b. Actual Operations

In accordance with the operation schedule outlined in the Operation and Maintenance Plan and as shown above, the structures were manipulated by Louisiana Department of Wildlife and Fisheries personnel. See the summary below of operations performed annually for the freshwater introduction structures.

- **2006** - Water control structures became operational in October, 2006. Stop-logs were set at marsh level at that time (approximately 1.0 NAVD). Stop logs were removed to -1.0 NAVD on October 23, 2006 due to a late tropical weather event that caused high tides and flooding from rainfall. Water levels rose to +2.0 NAVD in the Mermentau Basin in November and receded to +0.7 by the end of December.
- **2007** – Stop-logs in all structures remained at -1.0 NAVD throughout the year. Water levels ranged from 1.90 NAVD in January to 0.74 in November. Stop logs were replaced in December 2007 and set at +0.5 NAVD
- **2008** – Stop-logs were set at approximate marsh level (+1.0 NAVD). At the Old Cop-Cop structure, stop logs were removed between January and April. By June 2008, the structure was damaged and water control was compromised. In June 2008, stop-logs were removed from all remaining structures. After the heavy rainfall events, the stop-logs were replaced and set at +0.80 NAVD.
- **2009** – Stop-logs were removed in May 2009 and replaced in June 2009 (+0.80 NAVD). The stop-logs were again removed in October 2009.
- **2010** – Stop-logs were replaced in March 2010 and set at +0.80 NAVD.
- **2011** – Throughout the year, the stop logs were set at +0.80 NAVD due to low water levels and higher salinity.
- **2012** – In January 2012 the stop logs were removed. The stop-logs were replaced in April 2012 and set at +0.80 NAVD. The stop-logs were removed in July 2012 and again replaced and set at +0.80 NAVD in October 2012.
- **2013** –The stop-logs were removed in January 2013. In March 2013, the stop-logs were replaced and set at +0.80 NAVD. In May 2013, Chad Courville, manager of Miami Corporation, requested the stop logs be raised to 1.2 feet NAVD (0.2 feet above marsh level) from May until July 15th, 2013. This was requested because of observed lower water levels in Miami's marshes north of the Rockefeller-Miami Boundary Line Levee. The stop-logs were set to +1.20 ft NAVD in June 2013 and remained at that level until July 2014.
- **2014** – All stop-logs were removed in July 2014 but were replaced and set to +1.20 ft NAVD in August for the remainder of the year.

IV. Monitoring Activity

CWPPRA projects authorized for construction after August 14, 2003 will be monitored only with Coastwide Reference Monitoring System-*Wetlands* (CRMS) stations and other existing data collection. At the request of the federal sponsor (USFWS) one additional continuous recorder was specifically added to the project and will be funded through project-specific monitoring funds. There are 4 CRMS-*Wetlands* sites in the project area (Figure 2).

a. Monitoring Goals

The objective of the Freshwater Introduction South of Hwy 82 project is to protect and restore intermediate and brackish marshes within the project area over the 20-year project life.

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

1. Reduce the rate of marsh loss in Area A saline marshes from 0.16%/yr to 0.11%/yr, in Area A brackish marshes from 0.16%/yr to 0.10%/yr, in Area B marshes from 0.24%/yr to 0%/yr and Area C marshes from 0.56%/yr to 0.39%/yr.
2. Reduce mean salinity levels in Area A saline marshes from 20 ppt to 17 ppt, in Area A brackish marshes from 15 ppt to 11 ppt, and in Areas B and C, from 5 to 4 ppt.
3. Increase the coverage of emergent wetland vegetation within Areas A, B and C.
4. Increase the coverage of submerged aquatic vegetation (SAV) in the shallow open water areas within Areas A, B and C.

b. Monitoring Elements

Aerial Photography

For project specific data, near-vertical color-infrared aerial photography (1:12,000 scale) was used to measure vegetated and non-vegetated areas for the project area. The photography was obtained in post-construction year 2008 and will be collected again in 2016 and 2024. The original photography was checked for flight accuracy, color correctness and clarity and was subsequently archived. Aerial photography was scanned, mosaicked, and geo-rectified by USGS/NWRC personnel according to standard operating procedures (Steyer et al. 1995, revised 2000).

Aerial photography is collected for the entire coast through CRMS-*Wetlands* and will be used to evaluate ME-16 along with project-specific photography. Land:Water analysis of the 1 km CRMS sites will be done using an automated classification methodology using only manual delineation. Photography for the Mermentau Basin was collected and analyzed in 2005, 2008, and 2012.

Percent land trends were calculated using Landsat Thematic Mapper (TM) data for 1985 - 2010. Linear regressions were calculated for the period of record. The variability in percent land data points around the slope illustrate the influence of various sources of environmental variance or classification error. Positive slopes indicate increasing percent land or historical land gain and negative slopes indicate decreasing percent land or historical land loss (Couvillion et al., 2011).

Salinity

Salinity is monitored hourly utilizing 3 CRMS-*Wetlands* stations (599, 609, 610) within the project area and selected reference site 600. A project-specific continuous recorder (ME16-06) was installed within Muskrat Bayou southeast of Cop-Cop Bayou to further measure project effects on salinity levels (Figure 2). Salinity is measured every hour with a salinity gauge that is attached to the water-level gauge. The gauges are serviced at the same time. Continuous data will be used to characterize average annual salinities throughout the project and reference areas. At each servicing, a measurement of interstitial water salinity is collected adjacent to each gauge. Interstitial water salinity is also determined at the 10 vegetation plots, when vegetation is surveyed. Salinity data will be used to characterize the spatial variation in salinity throughout the project area and to determine if project area salinity is being maintained within the target range. For this report, data were available pre-construction at stations ME16-01, ME16-02, ME16-03, ME16-04R, ME16-05R, and pre- and post-construction at station ME16-06 and CRMS sites inside (599, 609) and outside (600) the project area. Though the boardwalk for CRMS0600 is located within the project area, the recorder is located outside of the project area at the mouth of Rollover Bayou where the reference station ME16-04R was previously located.

| Station | Location | Data Collection Period |
|----------------|--|-------------------------------|
| ME16-01 | No. of Cop Cop WCS | 5/21/01 – 2/19/04 |
| ME16-02 | So. of Cop Cop WCS | 5/21/01 – 2/19/04 |
| ME16-03 | Area A south of Boundary Line Canal | 6/21/01 – 2/19/04 |
| ME16-04R | Rollover Bayou mouth | 1/9/02 – 2/19/04 |
| ME16-05R | SW White Lake | 2/7/02 – 2/19/04 |
| ME16-06 | Area A so. of Cop Cop | 3/3/05 – present |
| CRMS0599 | SW Area A | 11/14/06 – present |
| CRMS0609 | NE Area A | 12/11/07 – present |
| CRMS0600 | SE Area A | 7/7/2011 – present |

Water Level

Water level within the marsh is measured at every salinity station every hour with a water-level gauge installed within an area that is hydrologically connected to the surrounding water body. The gauge is surveyed relative to the top of the RSET (NAVD 88). The water-level gauge is serviced on approximately a monthly basis. Water level data is used to document the variability in water level in the project and reference areas.

Vegetation

Vegetation composition and cover is estimated from 10 permanent 2x2 m plots that are randomly distributed along a transect in the emergent marsh within each of the 1 km² CRMS-*Wetlands* sites. Data were collected in early fall of 2006 - 2014 using the Braun Blanquet method.

Individual species' cover data are summarized according to the Floristic Quality Index (FQI) method (Cretini and Steyer 2011). A list of plants occurring in Louisiana's coastal wetlands (~500 species) was provided to all known Louisiana coastal vegetation experts and their input on scoring was requested. The panel then provided an agreed upon group score (Coefficient of Conservatism or CC score) for each species. CC scores are weighed based on cover in the FQI for Louisiana coastal wetlands. All species known to occur in the coastal zone were given a floristic quality score on a scale of 0 to 10. Species that scored the lowest were considered by the panel to indicate disturbance or unstable marsh environments. CRMS sites inside (599, 600, 609, 610) the project were used for this report.

Soil Properties

Soil cores were collected one time (within a year of site establishment) 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 the site. The soil was processed by the Department of Agronomy and Environmental Management at Louisiana State University.

Elevation Change

Soil surface elevation change utilizing a combination of sediment elevation tables (RSET) and vertical accretion from feldspar horizon markers are being 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 was surveyed to a known elevation datum (ft, NAVD88) so it can be directly compared to other elevation variables such as water level. Data collected over at least 5 years was used to calculate rates for the project and reference areas; therefore the displayed elevation change rates are an estimation of that temporal trend.

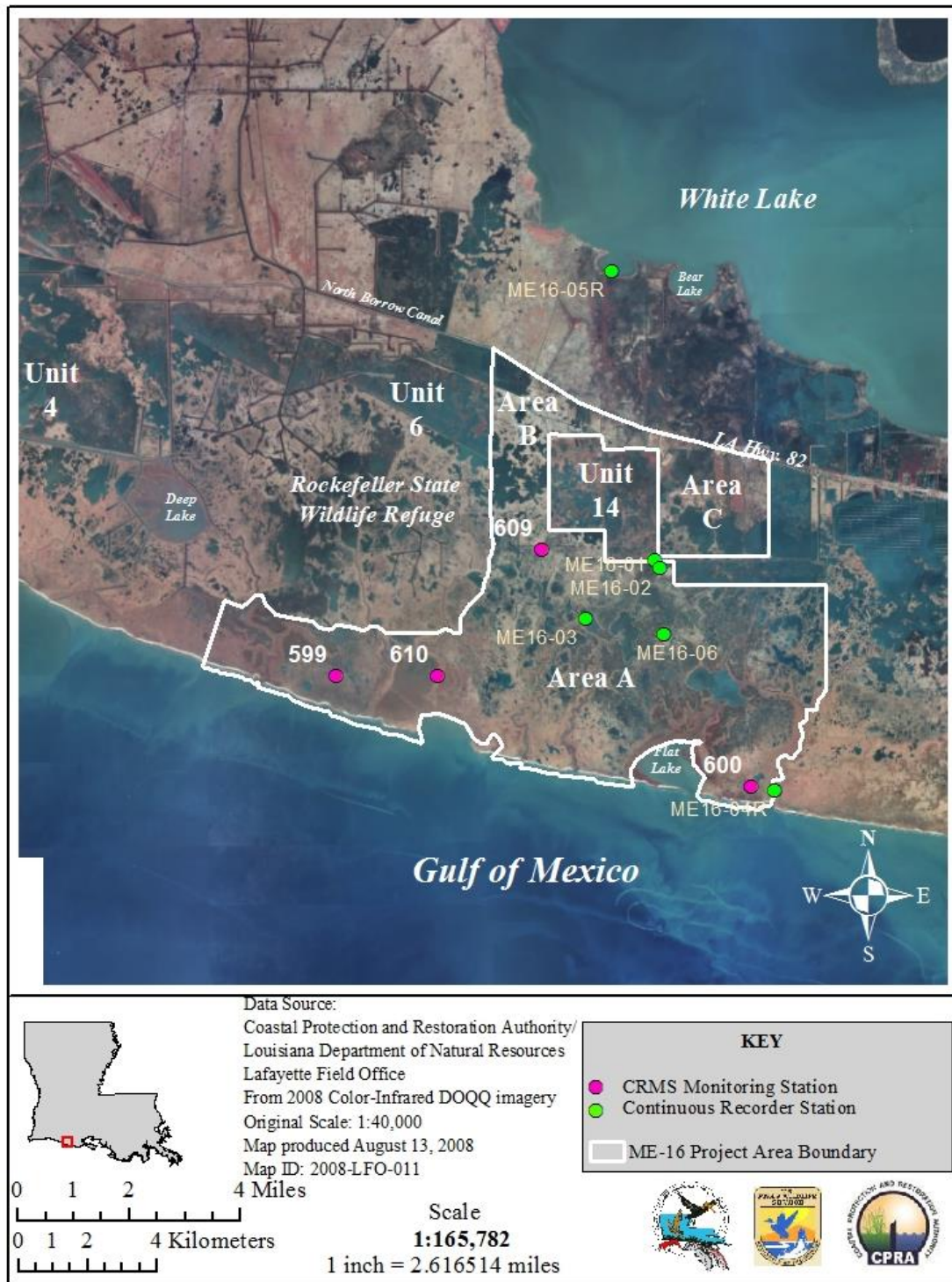


Figure 2. Location of project-specific monitoring stations and CRMS-Wetlands stations within Freshwater Introduction South of Hwy 82 (ME-16) project area and surrounding marsh.

c. Monitoring Results and Discussion

Aerial Photography

Post-construction land:water analysis was completed for the 2008 aerial photography (Figure 3). Results indicated 74.15% land and 25.84% water within the project area. Future analysis will help to better determine the project's effect on land change.

For the four CRMS-Wetlands stations within the project area, the 2005, 2008 and 2012 digital imagery was collected (Table 1). Land loss occurred at Station 600 (~16 acres) while stations 599, 609 and 610 saw small gains.

The general land change trend within the project area prior to construction was slightly positive (0.04% per year) from 1985 to 2005 (Figure 4). Incorporating the 2005 to 2010 data, which includes the post-construction satellite imagery, causes the general trend to become slightly negative (-0.07% per year). Land loss occurred in 2005, 2008 and 2009 following Hurricanes Rita and Ike, but the project area saw a 3% (795 ac) gain in 2010.

Table 1. Land:Water acreages for 2005, 2008 and 2012 at CRMS sites in the project area.

| CRMS Site | | 2005 | | 2008 | | 2012 | | Change 2005 to 2012 |
|---------------------|-------|-------|-------|-------|-------|-------|-------|---------------------------|
| | | acres | % | acres | % | acres | % | acres |
| 599 | Land | 225 | 90.73 | 226 | 91.13 | 228 | 91.93 | 3 |
| | Water | 23 | 9.27 | 22 | 8.87 | 20 | 8.06 | |
| | Total | 248 | | 248 | | 248 | | |
| 600 | Land | 233 | 93.95 | 225 | 90.73 | 217 | 87.5 | -16 |
| | Water | 15 | 6.05 | 23 | 9.27 | 31 | 12.5 | |
| | Total | 248 | | 248 | | 248 | | |
| 609 | Land | 180 | 72.58 | 178 | 71.77 | 184 | 74.19 | 4 |
| | Water | 68 | 27.42 | 69 | 28.94 | 64 | 25.81 | |
| | Total | 248 | | 248 | | 248 | | |
| 610 | Land | 236 | 95.16 | 237 | 95.56 | 240 | 96.77 | 4 |
| | Water | 12 | 4.84 | 11 | 4.44 | 8 | 3.23 | |
| | Total | 248 | | 248 | | 248 | | |
| Total change | | | | | | | | -5 |

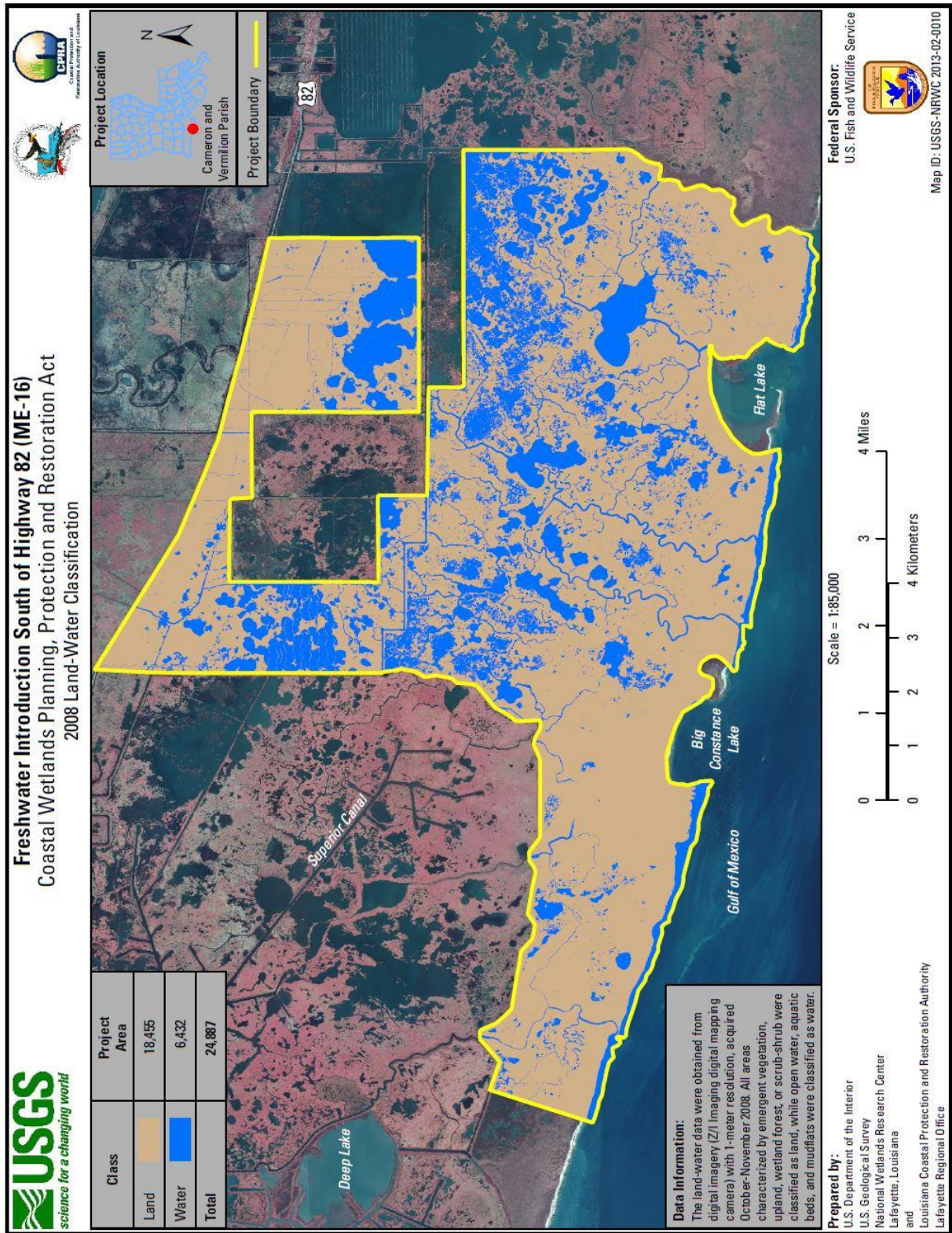


Figure 3. Freshwater Introduction South of Highway 82 (ME-16) project 2008 land/water analysis.

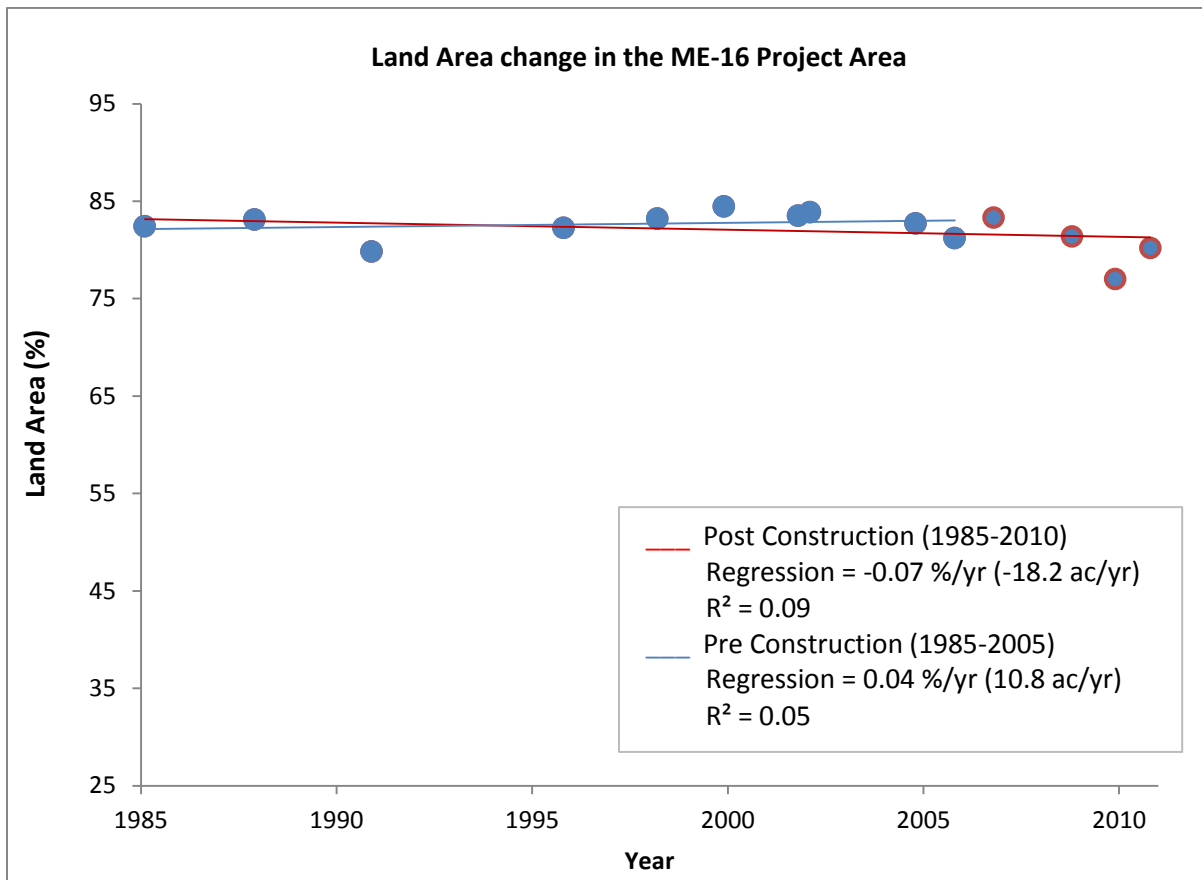


Figure 4. Project scale percent land change for ME-16. Percent land values are displayed for all cloud free TM images available for 1984-2010. The red line depicts the percent land trend for the entire period of record. The blue line depicts the percent land trend for the pre-construction time period only. Percent land calculated as percent land of total project area. See Couvillion et al. 2011.

Salinity

Pre-construction data was collected for the hydrodynamic model from May 2001 through February 2004 at project sites and reference sites (Table 2). ME16-01, located in the boundary line canal south of Unit 14 (Area C), was below the target range of 4 ppt for intermediate marshes 71% of the time, pre-construction. Project area brackish stations (ME16-02 and ME16-03), located in Area A, were below the target range of 11 ppt roughly 68 and 56% of the time, respectively, pre-construction. Station ME16-4R, located at the mouth of Rollover Bayou, near the Gulf of Mexico (considered saline), was under 17 ppt 81% of the time the station was active. Station ME16-05R, located in Grand Volle Lake, is considered a source of fresh water for the project area. Salinities were below the target range of 4 ppt for fresh marshes 100% of the time. All stations but Station ME16-06 were removed prior to construction.

Table 2. Salinities during model development (May 2001 – February 2004)

| Station | Area | Marsh Type | Salinity (ppt) | | %Time within Target |
|----------|----------------------|--------------|----------------|---------|---------------------|
| | | | Target | Average | |
| ME16-01 | C | Intermediate | 4 | 3.37 | 71 |
| ME16-02 | No. A | Brackish | 11 | 7.96 | 68 |
| ME16-03 | Central A | Brackish | 11 | 10.59 | 56 |
| ME16-4R | Ref – Rollover Canal | Saline | 17 | 11.17 | 81 |
| ME16-05R | Ref – SW White Lake | Intermediate | 4 | 0.32 | 100 |

Pre- and Post-construction data were collected at site ME16-06. Brackish project area station ME16-06 was within the target range only 14% in the year prior to construction but since construction in October 2006, salinities have been within the target range 32% of the time, even though the recorder was only within target salinity range 14.27% of the drought year of 2011 (Figure 5a).

Post-construction data was collected at sites CRMS0599 and CRMS0609. CRMS station 599, which is a saline project area station, had salinities below the 17 ppt saline target salinity 63% of the time (Figure 5b). CRMS station 609, a brackish station located just southeast of water control structure No. 10 (Area A), was within the target range 42% of the time for December 2007 – December 2014 (Figure 5c). During 2011, it was within target only 23% of the time.

For the period 2011-2014, average weekly salinities at project station ME16-06 and CRMS0609 were compared to reference station CRMS0600 to determine if a difference in salinity occurred between the project and reference area (Figure 5d). The only significant effect was by year with 2011 being more saline than all other years ($F_{3,356} = 20.86$, $p < 0.0001$). The project and reference areas behaved very similarly during this time period except for 2012 where there is a slight separation as the project more efficiently maintains fresh water during the heavy rain year ($F_{3,356} = 2.129$, $p < 0.0961$), but this effect was only marginally significant due to both areas declining in concert.

Therefore, the goal to reduce salinities post-construction produced mixed results. When adequate water levels were high enough to open the structures, the project was very effective at reducing salinity levels in Area A (Table 3). During these maintenance operations, the project met the target salinity goals 67% of the time at CRMS0609 and 55.7% of the time at ME16-06. Benefits are reduced once the structures are closed. When the stop logs are set within the range of the operation plan (0.5 ft to 0.8 ft NAVD88), target salinities in Area A were reached nearly half as often as when the stop logs are removed (39.5% at CRMS0609

and 22.5% at ME16-06). However, when the stop logs are raised to 1.2 ft NAVD 88 (0.2 ft above marsh level) target salinity goals in the central part of Area A were reached less than 15% of the time.

Table 3. Percentage of time salinities were inside and outside of brackish target range for project stations CRMS0609 and ME16-06 at various stop log settings.

| Station | Stop Log Position (ft NAVD 88) | Average Salinity | % Time within Target Salinity | Time Frames of Stop Log Setting |
|----------|--------------------------------|------------------|-------------------------------|--|
| CRMS0609 | Removed | 7.3 | 66.5 | Oct 2006 – Dec 2007, July 2008 – Dec 2009, May 2009, Oct 2009 – Mar 2010, Feb 2012 – April 2012, Aug 2012 – Sept 2012, Jan 2013 – Mar 2013, Aug 2014. |
| | 0.5 – 0.8 | 13.78 | 39.5 | Jan 2008 – June 2008, Jan 2009 – Apr 2009, June 2009 – Sept 2009, Apr 2010 – Jan 2012, May 2012 – July 2012, Oct 2012 – Dec 2013, Apr 2013 – June 2013 |
| | 1.2 | 15.16 | 22.7 | July 2013 – July 2014, Sept 2014 – Apr 2015 |
| ME16-06 | Removed | 10.49 | 55.7 | Oct 2006 – Dec 2007, July 2008 – Dec 2009, May 2009, Oct 2009 – Mar 2010, Feb 2012 – April 2012, Aug 2012 – Sept 2012, Jan 2013 – Mar 2013, Aug 2014. |
| | 0.5 – 0.8 | 15.97 | 22.5 | Jan 2008 – June 2008, Jan 2009 – Apr 2009, June 2009 – Sept 2009, Apr 2010 – Jan 2012, May 2012 – July 2012, Oct 2012 – Dec 2013, Apr 2013 – June 2013 |
| | 1.2 | 16.97 | 14.3 | July 2013 – July 2014, Sept 2014 – Apr 2015 |

Means by month of interstitial water salinity is presented in Figures 6a and 6b. The highest salinities occurred in project stations 599 and 600, averaging over 20 ppt since 2011. Project station 609 (NE Unit A) saw an increase in salinities due to the drought of 2011 and has taken a few years to drop back down below 15 ppt at the 10 cm level. Salinities at the 30 cm level were still around 17 ppt at this site. Project station 610 (SW Unit A) has seen a steady decline in salinities since 2011, dropping to near 12 ppt at the 10 cm level and dropping from 20 ppt to 15 ppt at the 30 cm level.

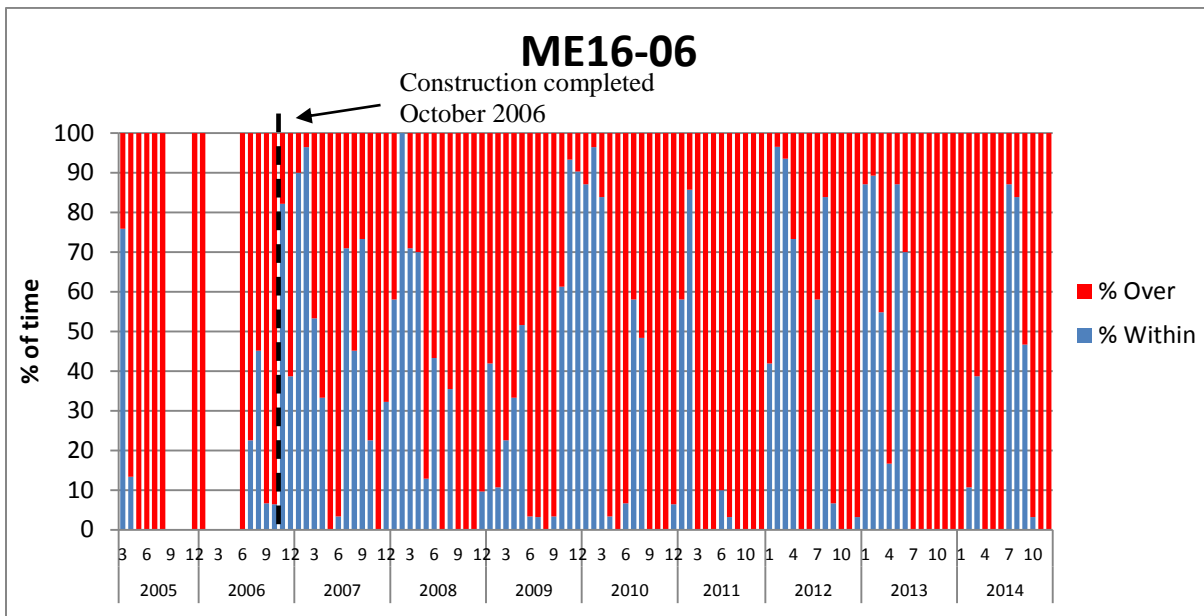


Figure 5a. Percentage of month salinities were inside and outside of brackish target range for project station ME16-06 in Muskrat Bayou (Central Area A).

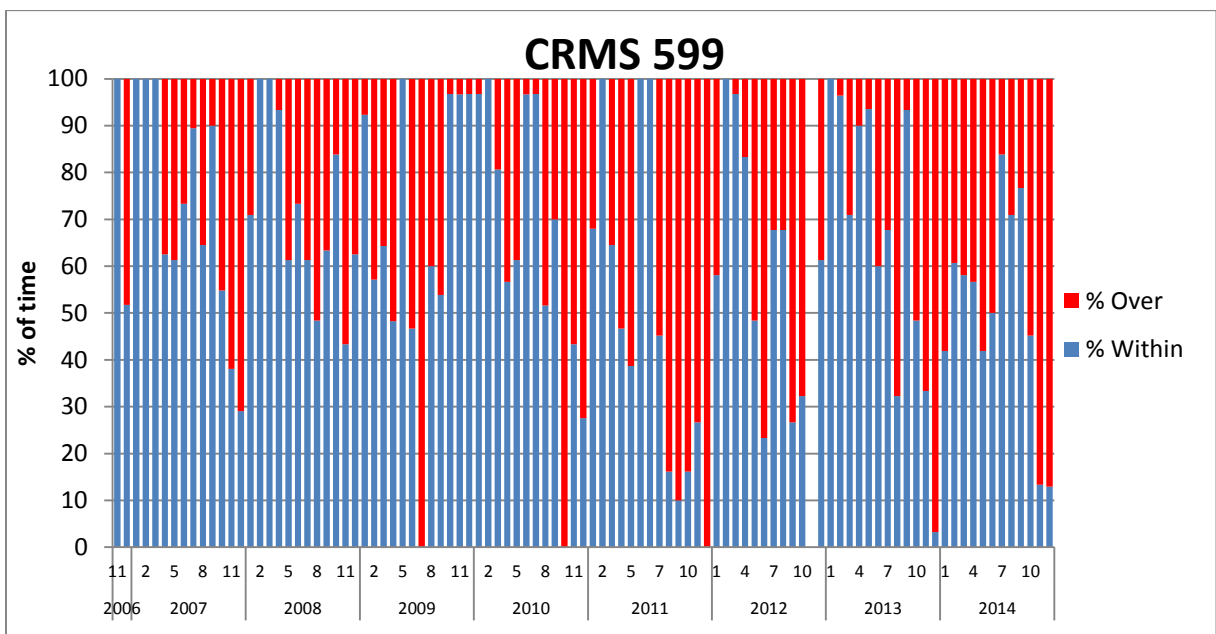


Figure 5b. Percentage of month salinities were inside and outside of saline target range for post-construction project station CRMS0599, southwest of Big Constance Bayou control structure.

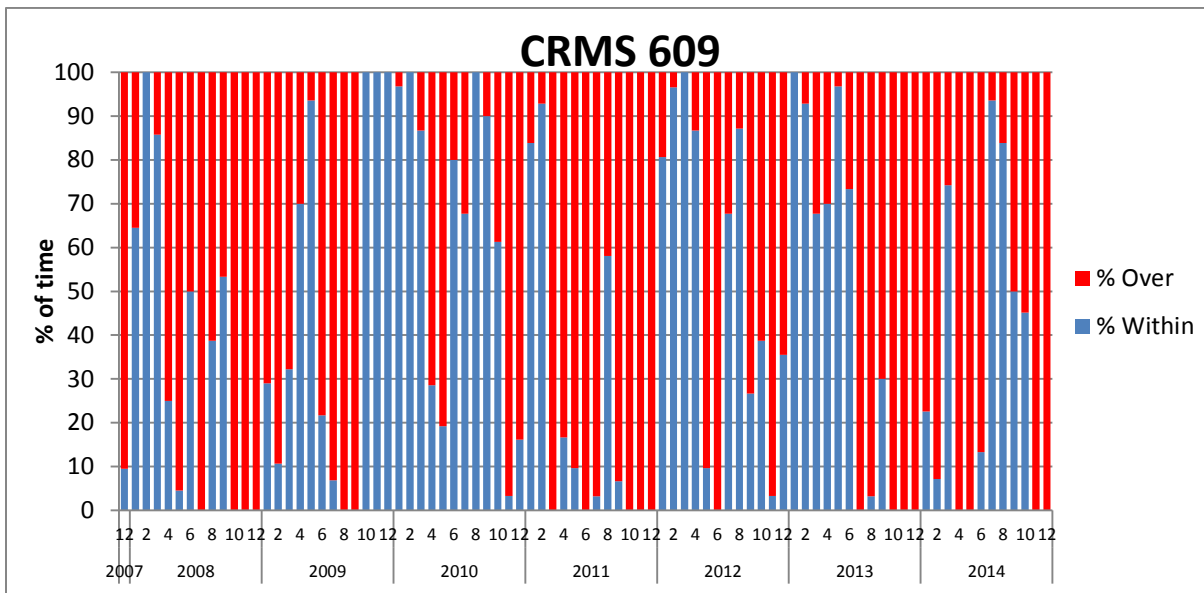


Figure 5c. Percentage of month salinities were inside and outside of brackish target range for project station CRMS0609, located southeast of water control structure No. 10 (Area A).

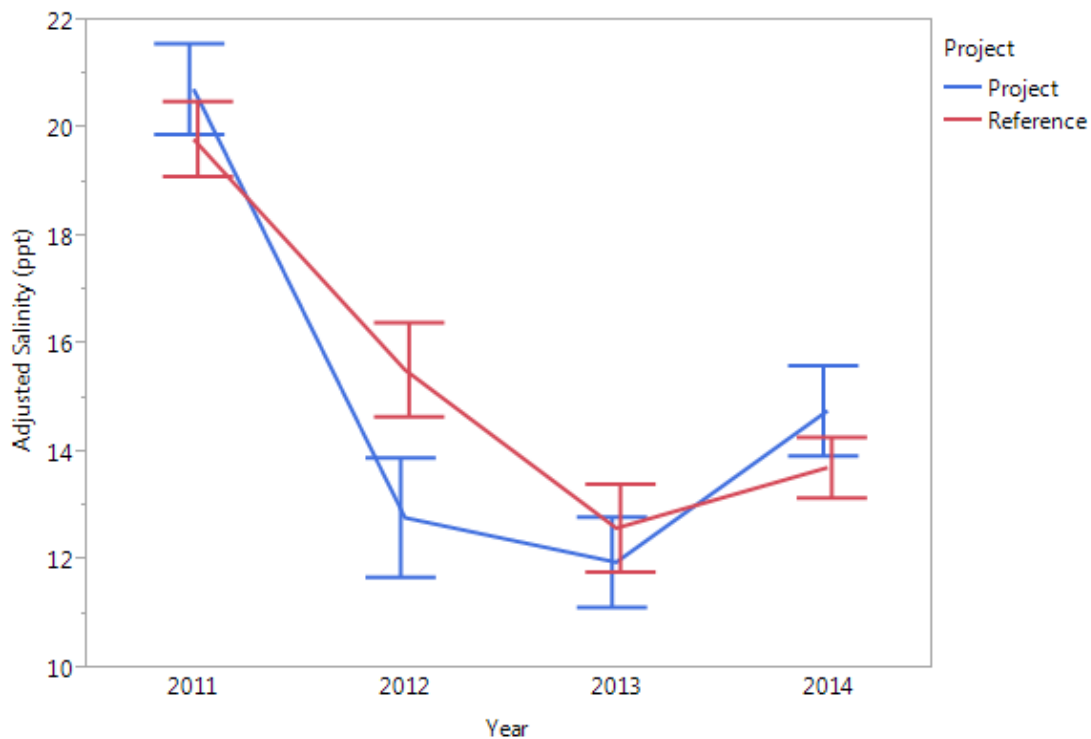


Figure 5d. Weekly means and standard errors of continuous salinity collected at project stations (ME16-06, CRMS0609) and reference station CRMS0600 from 2011-2014.

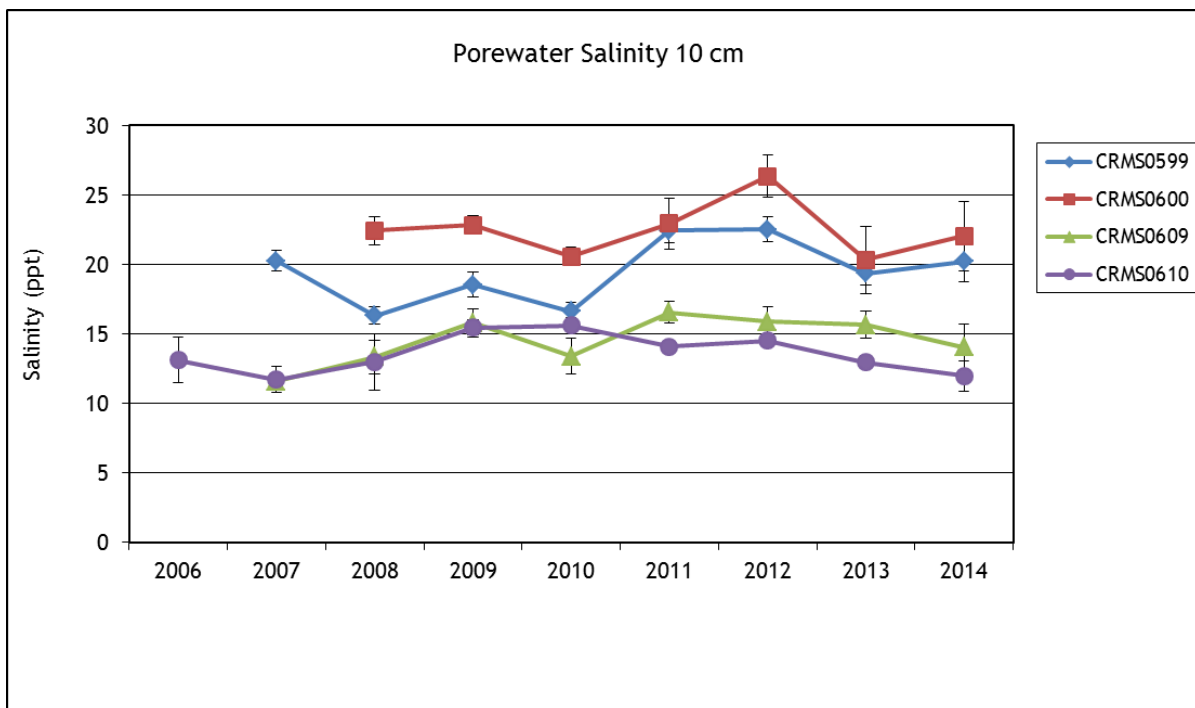


Figure 6a. Yearly Means of Interstitial water salinity at 10 cm below the soil surface. Error bars, where present, represent the mean of stations in that class for that month \pm 1 Std Err.

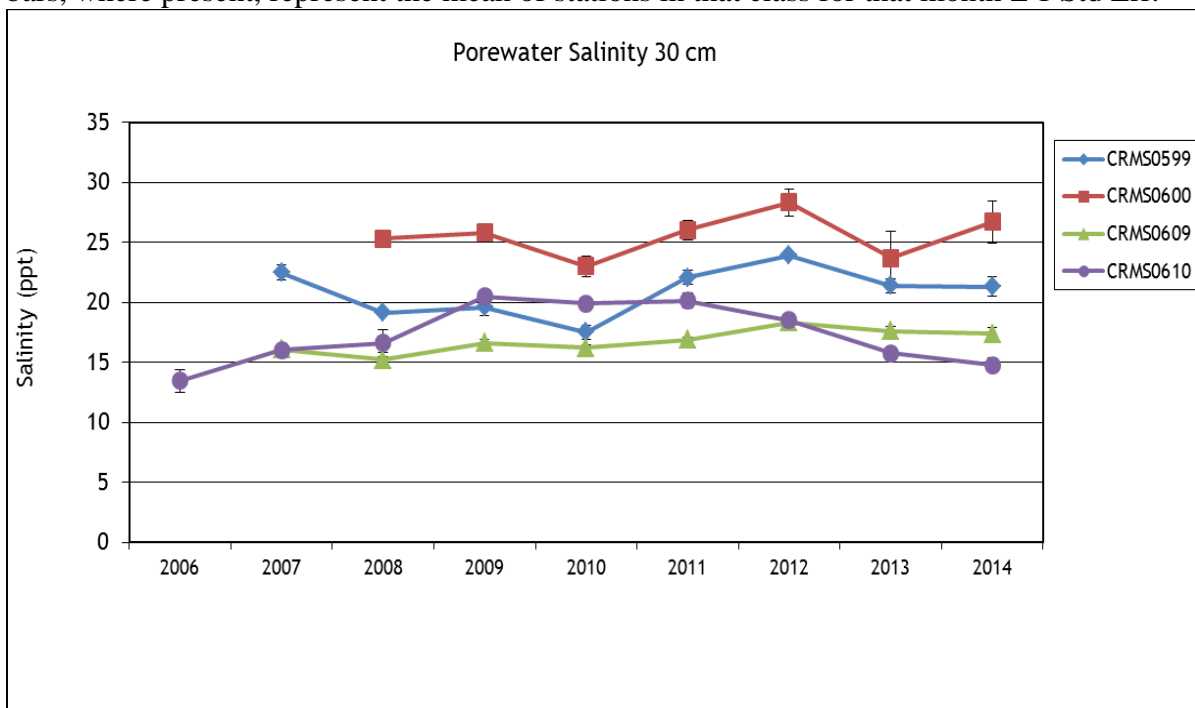


Figure 6b. Yearly Means of Interstitial water salinity at 30 cm below the soil surface. Error bars, where present, represent the mean of stations in that class for that month \pm 1 Std Err.

Water Level

Pre-construction water levels (Figure 7a) at the three project and two reference sites typically followed the same pattern, though water levels were generally higher at ME16-05R during high rain events. Elevated water levels in October 2002 were due to the effects of Hurricane Lili. Because the project was west of the hurricane, storm surge effects were minimal, although the area received 3.03 inches of rainfall (Guthrie Perry, personal communication, August 14, 2008). Hurricane Rita made landfall west of the project in September 2005 (Figure 7b) during construction. The recorder at ME16-06 was overtopped by the storm surge and malfunctioned and the water control structures sustained damage. Estimated surge levels in the project area were approximately 9 ft NAVD88 (McGee et al. 2006). The water control structures in the project area became functional again in October of 2006 (Hess 2008). Hurricane Ike struck the coast of Texas in September of 2008. All recorders within the project and reference areas were again overtopped by the storm surge, but according to USGS data, surge levels reached 8-9 ft NAVD88 during this storm (East et al. 2008). Elevated tides in July and September of 2010 increased both water levels and salinities. Heavy rainfall events occurred in October 2009, December 2010, most of 2012 as well as the fall of 2013 and 2014, causing increased water levels and reduced salinities throughout the project and reference areas. One interesting note is heavy rainfall in January of 2013 which caused elevated water levels at CRMS0609 in the northern part of Area A, but did not cause increased water levels in the central portion of Area A or in Rollover Bayou. The project area recorders (ME16-06, CRMS0609), generally tracked very well with the water levels at CRMS0600, showing the influence of the Gulf of Mexico on the project area.

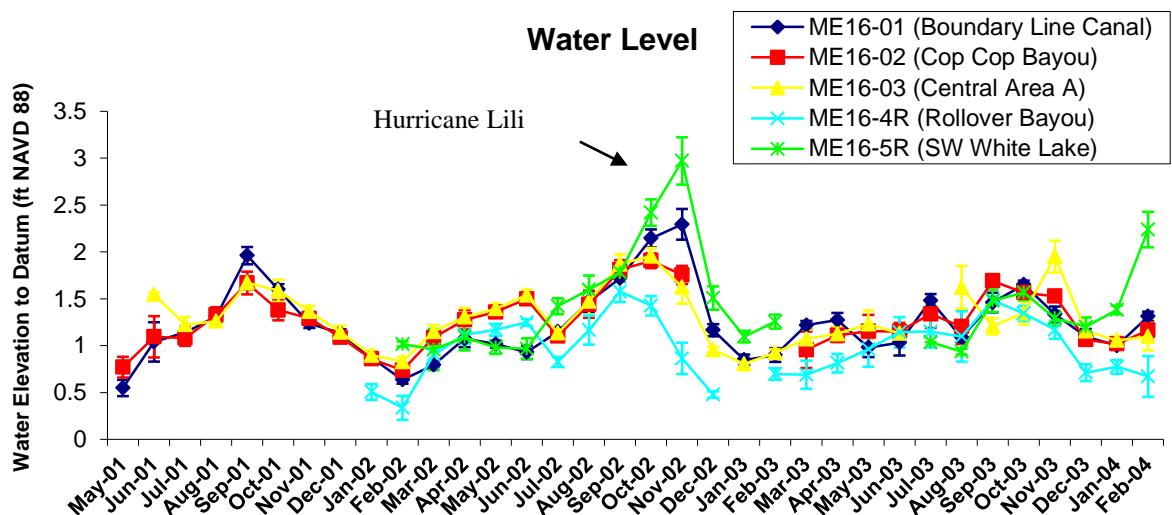


Figure 7a. Monthly means (± 1 SE) of water level data collected pre-construction within the ME-16 project and reference areas.

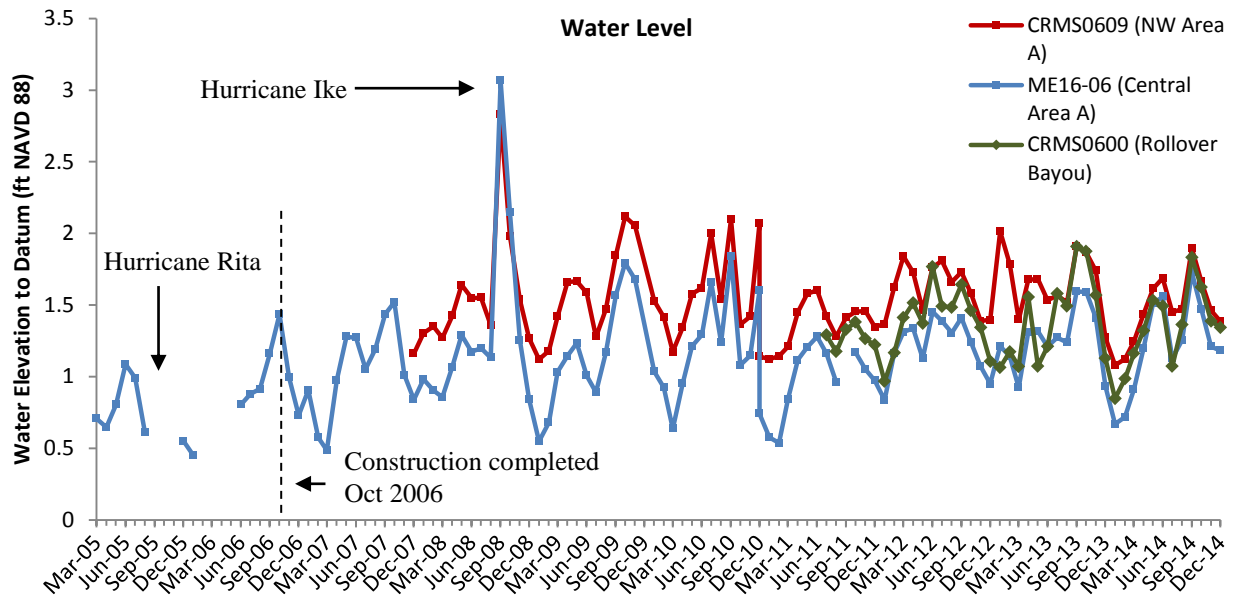


Figure 7b. Monthly means of water level data collected pre- and post-construction at ME16-06 and CRMS stations within (609) and outside (600) project area.

Vegetation

The project achieved the goal of increasing the coverage of emergent wetland vegetation prior to the drought of 2011. All stations showed an increase in cover and floristic quality after recovering from the effects of Hurricanes Rita and Ike (Figures 8a – 8d). Brackish site 609, located in the northern part of Area A, has shown a steady decrease in cover and FQI since 2011. This site has been largely dominated by *Spartina patens* through all years sampled, with traces of *Schoenoplectus robustus* and *Distichlis spicata*. In 2014, the appearance of *Spartina alterniflora* at the site resulted from higher soil salinities over the last several years.

The three CRMS sites within the southern part of the project area (599, 600, 610) are traditionally considered to be saline sites. The 2014 vegetation survey classified these sites as brackish. However, the species surveyed and the interstitial salinities are more representative of a saline marsh. Future surveys will better determine if the sites are seeing a shift in marsh class or just seasonal variation. Site 610 showed a minor impact from the drought in 2012 and appeared to recover by 2013, but again showed a drop in cover and CC score in 2014. Sites 599 and 600 showed only minor impacts from the drought, both recovering by 2014 to near pre-drought levels. These sites all have similar species assemblages to the brackish site 609 above (*S. patens*, *D. spicata*, *S. robustus*). The difference appears to be a larger concentration of *D. Spicata*, a more salt tolerant species. In 2011, *Batis maritima*, a saline species, appeared at station 600 and has remained since.

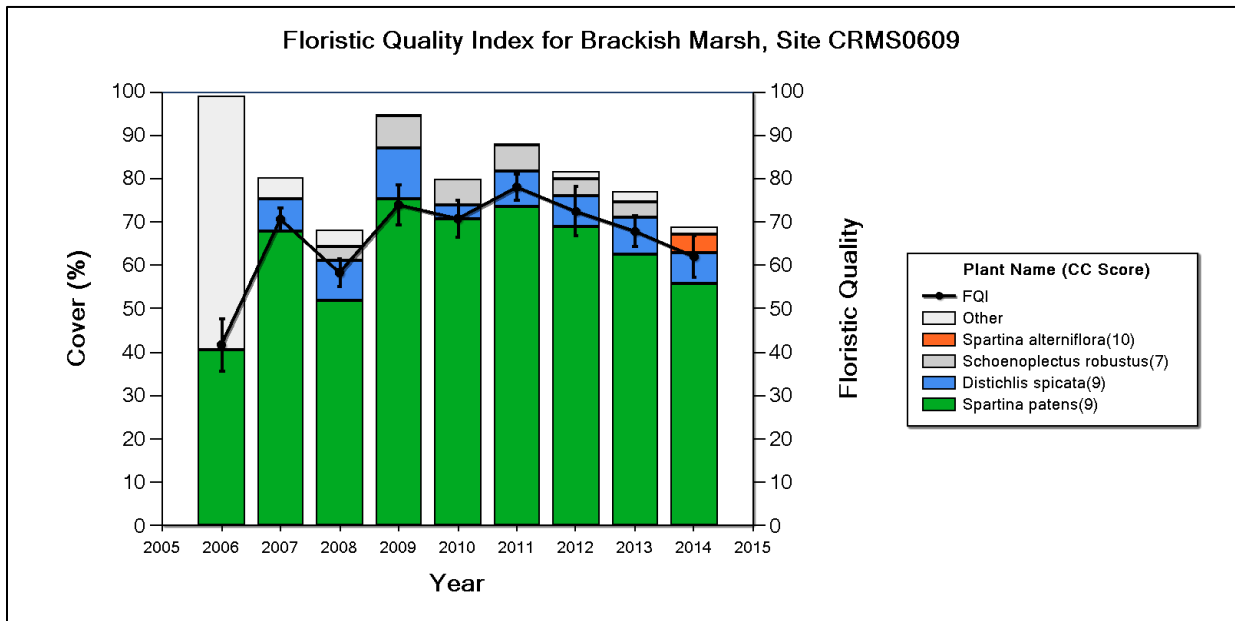


Figure 8a. Percent coverage and floristic quality index of species collected from CRMS site 609, NE Area A, within the project area in years 2006 – 2014. The Coefficient of Conservatism (CC) scores represent the quality of individual species from 1 to 10 where 1 represents disturbance species and 10 indicates stable species.

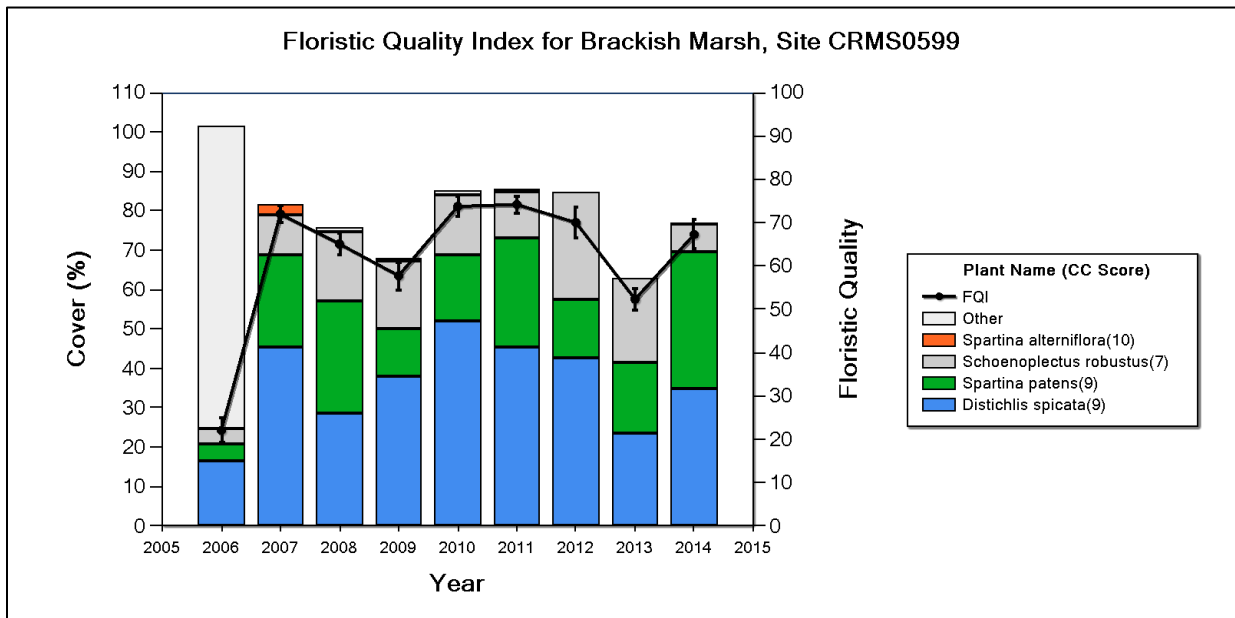


Figure 8b. Percent coverage and floristic quality index of species collected from CRMS site 599, SW Area A, within the project area in 2006 - 2014. The CC scores represent the quality of individual species from 1 to 10 where 1 represents disturbance species and 10 indicates stable species.

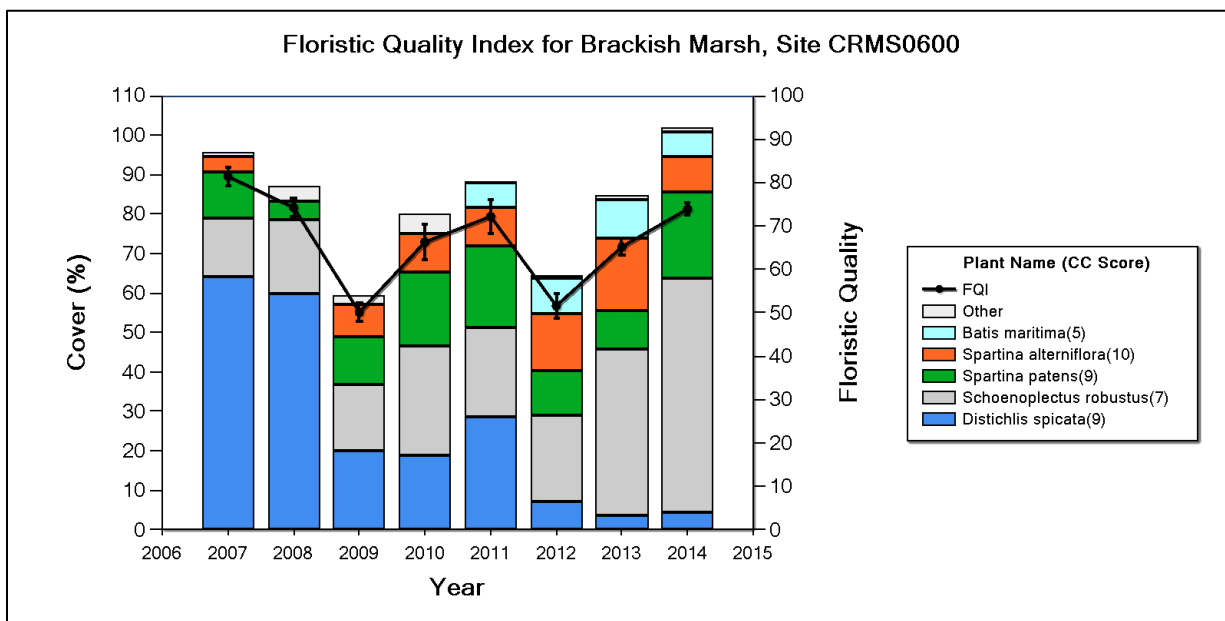


Figure 8bc. Percent coverage and floristic quality index of species collected from CRMS site 600, SE Area A, within the project area in years 2007 – 2014. The CC scores represent the quality of individual species from 1 to 10 where 1 represents disturbance and 10 indicates stable species.

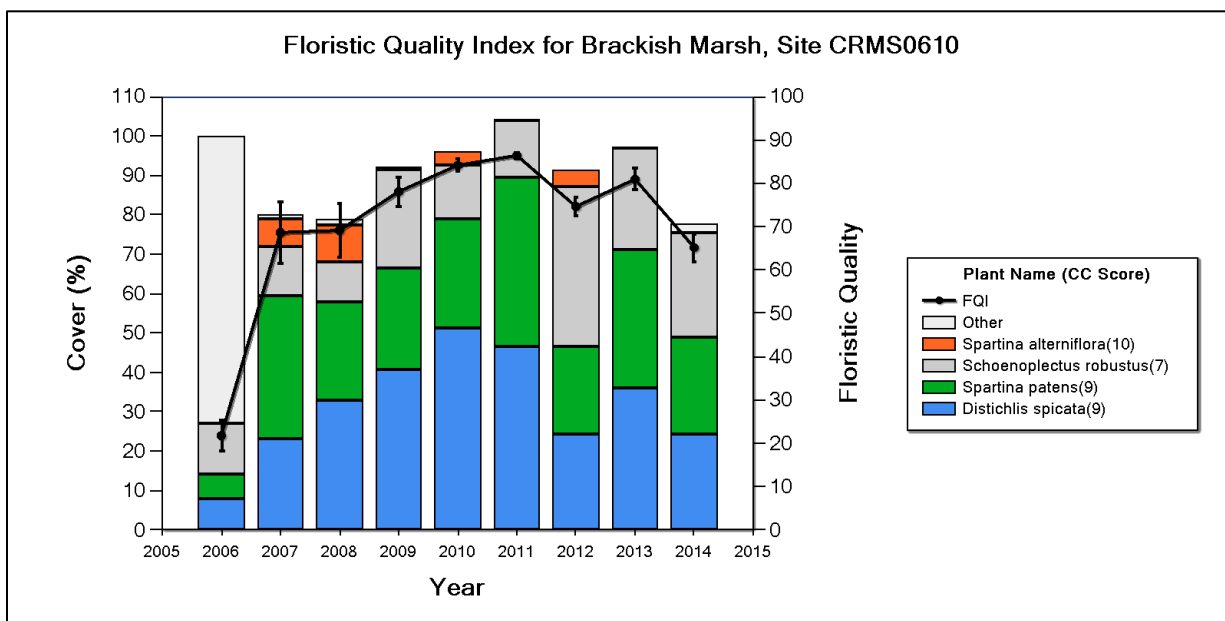


Figure 8d. Percent coverage and floristic quality index of species collected from CRMS site 610, SW Area A, within the project area in years 2006 - 2014. The CC scores represent the quality of individual species from 1 to 10 where 1 represents disturbance and 10 indicates stable species.

Soil Properties

Soil samples were collected at each of the CRMS-Wetlands sites in the project area (599, 600, 609, 610) and selected reference site 615. The soil properties data were sampled in 4 cm increments. All cores were sampled after Hurricane Rita. Figures for mean bulk density and percent organic matter (OM%) by CRMS station are presented in Figures 9a and 9b. Higher bulk densities occurred at project area sites 610 and 600 near the Gulf of Mexico, which would be expected since denser soils tend to occur in salt marshes. These sites also had the lowest OM% (<20% throughout the core). Lower bulk densities and higher OM% were found in the bottom half of the core at site 609.

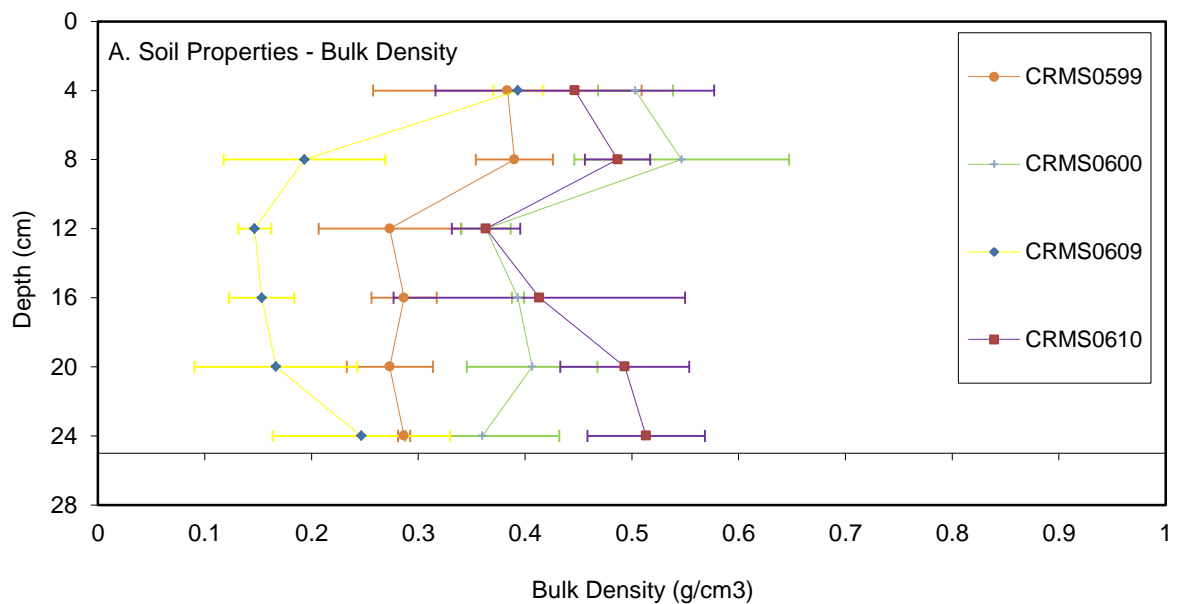


Figure 9a. Mean \pm 1 Standard error of soil bulk density collected at project and reference CRMS stations.

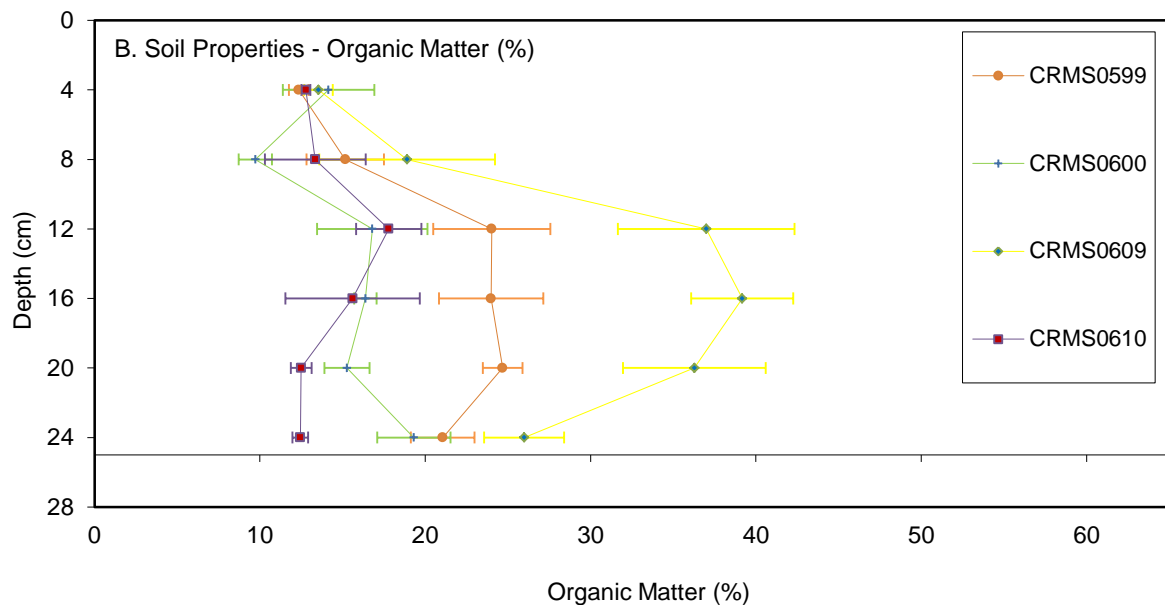


Figure 9b. Mean \pm 1 Standard error of soil organic matter collected at project and reference CRMS-Wetlands stations.

Elevation Change

Subsidence and accretion data at ME-16 CRMS sites 599, 600, 609 and 610 show the project area had a slight gain to moderate loss (+0.02 cm/yr to -0.51 cm/yr). Project sites 599 and 609 essentially showed no change in elevation over the sampling period indicating the sites located in close proximity to water control structures are generally stable likely due to sediment input through the structures. They are, however, not maintaining elevation when compared to the Sabine Pass NOAA tide gauge sea level rise estimate of 0.6 centimeters per year (Zervas 2009). CRMS sites 600 and 610 showed moderate negative elevation change rates (-0.32 and -0.51 cm/yr, respectively). This is likely due to their isolation from any sediment source and a high subsidence rate.

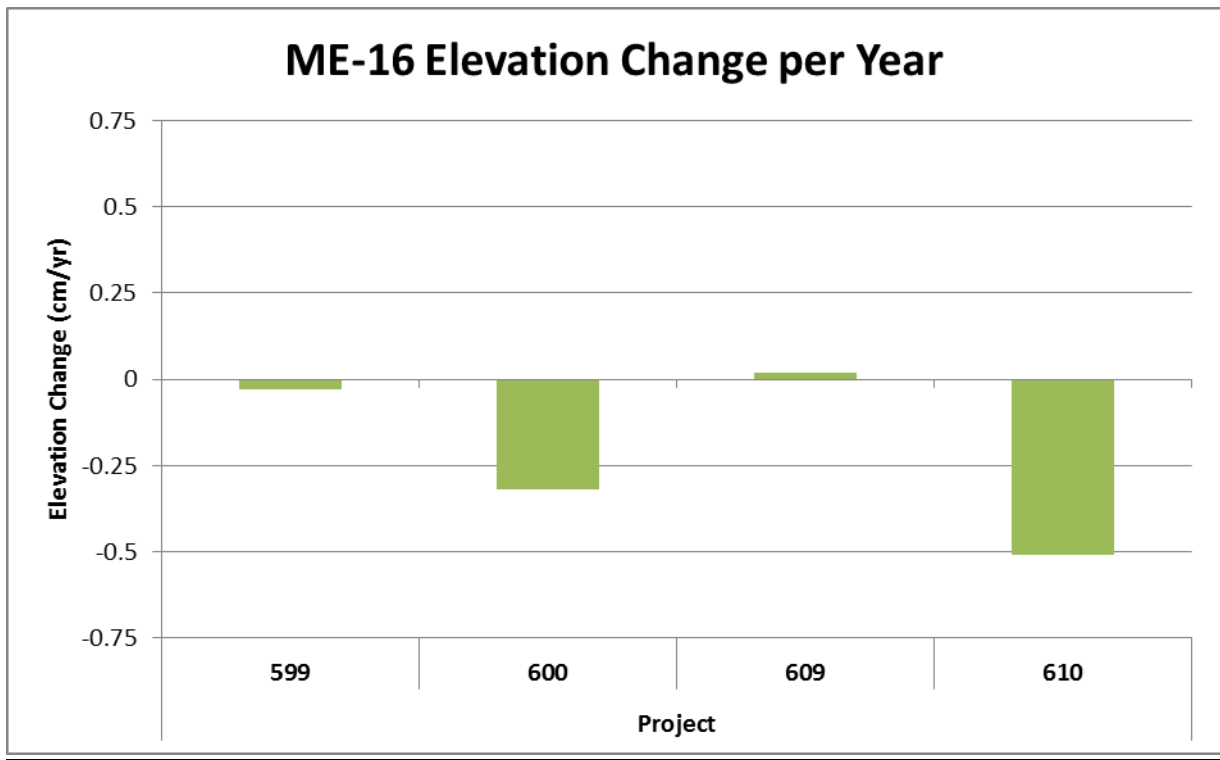


Figure 10. Elevation change per year experienced in the ME-16 project CRMS sites.

V. Conclusions

a. Project Effectiveness

Hurricanes Rita in 2005 and Ike in 2008 caused mild land loss in the project area, but the project appeared to be recovering by 2010. Land:Water Analyses conducted within the 1 km CRMS sites in 2012 showed small gains in land at 3 of the 4 sites. Future Land-Water classifications of the project area will help to better determine if the project is meeting the goal of reducing marsh loss in project area marshes.

The project has been effective at reducing surface water salinities in Area A during normal climatic conditions. Brackish marshes in the project area have seen reduced salinities when adequate rainfall exists to allow the water control structures to open and fresh water to flow. The project has not been able to meet the goal of reducing mean salinities to the target level in interstitial water salinities. Project area stations were approaching the goals by 2010 after enduring the storm surges of two hurricanes, but the drought in 2011 again caused a spike in salinity levels. Even with ample rainfall over the last several years, interstitial salinities have been slow to decline. Interstitial salinities along the gulf shoreline are still averaging above 20 ppt. In the brackish marshes of Area A, average salinities were lower, but were still above the target range of 11 ppt.

The project was achieving the goal of increasing the coverage of emergent wetland after recovering from Hurricanes Rita and Ike. The cover and quality of vegetation in the project area was severely impacted by the hurricanes but had recovered and remained high at project area sites until the drought in 2011. The project is showing signs of recovery from the drought in the saline marshes of the project, but the vegetation in the brackish marshes of Area A has still not recovered from the drought, likely due to the lingering increased soil salinities.

Overall the structural components of Freshwater Introduction South of Hwy 82 Project are in good condition and functioning as intended. The 2011 post Hurricane Ike maintenance event of placing additional rip rap repaired hurricane damage and provided added armament for the structures.

b. Recommended Improvements

- Lifting chains should be provided on the flapgates at the Hess' Cut (formerly New Dyson), New Cop Cop, and Structure No. 10.
- Rock rip rap should be filled in closer to the structure at Structure No. 10.
- Concrete on the Little Constance Structure which was damaged by the rock placement during the maintenance event needs repair.
- Structural operations should return to the original operations plan.

c. Lessons Learned

The use of spray dredge technology in performing the enlargement of Grand Volle Channels and Highway 82 Channel enlargement was very beneficial in that the spoil material from these areas was thinly spread out over the existing marsh and did not have any adverse effects as compared to conventional bucket dredging with built up spoil bank. Within a few months' time, the spray dredge disposal areas were barely visible and the marsh was in pre-construction condition.

The ME-16 operation plan has benefitted the project area marshes in Area A. When conditions allow (water levels above target range), the project has shown reduced salinities when water control structures are open allowing freshwater flow to Area A to the south. In addition, when the water level is below target range, and stop logs are set at or below marsh elevation as per the current operation plan, salinity levels are reduced. However, salinity levels increase when stop logs are set above marsh level as has been done since 2013.

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APPENDIX A

(Inspection Photographs)





Photo No. 1, New Cop-Cop Structure, outlet side of structure.



Photo No. 2, New Cop-Cop Structure, inlet side of structure.



Photo No. 3, Perry Bayou Structure, outlet side of structure.



Photo No. 4, Perry Bayou Structure, inlet side of structure.



Photo No. 5, McNeese Bayou Structure, inlet side of structure.



Photo No. 6, McNeese Bayou Structure, outlet side of structure.



Photo No. 7, Hess' Cut Structure, outlet side of structure.



Photo No. 8, Hess' Cut Structure, inlet side of structure.



Photo No. 9, Little Constance Structure, east side of structure.



Photo No. 10, Little Constance Structure, west side of structure.



Photo No. 11, Earthen Terraces



Photo No. 12, Earthen Terraces

APPENDIX B
(Three Year Budget Projection)



FRESHWATER INTRODUCTION S. OF HWY 82/ ME-16 / PPL 9
Three-Year Operations & Maintenance Budgets 07/01/2015 - 06/30/2018

| | | | |
|------------------------|--------------------------|------------------------|--------------------|
| <u>Project Manager</u> | <u>O & M Manager</u> | <u>Federal Sponsor</u> | <u>Prepared By</u> |
| Darrell Pontiff | Dion Broussard | USFWS | Dion Broussard |

| | 2015/2016 (-9) | 2016/2017 (-10) | 2017/2018 (-11) |
|-----------------------------------|----------------|-----------------|-----------------|
| Maintenance Inspection | \$ 6,851.00 | \$ 7,057.00 | \$ 7,269.00 |
| Structure Operation | | | |
| State Administration | | \$ - | \$ - |
| Federal Administration | | \$ - | \$ - |
| Maintenance/Rehabilitation | | | |

15/16 Description:

| | |
|-------------------------------|--------|
| E&D | \$0.00 |
| Construction | \$0.00 |
| Construction Oversight | \$0.00 |
| Sub Total - Maint. And Rehab. | \$ - |

16/17 Description:

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

17/18 Description:

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

| | 2015/2016 (-9) | 2016/2017 (-10) | 2017/2018 (-11) |
|------------------------------|----------------|-----------------|-----------------|
| Total O&M Budgets | \$ 6,851.00 | \$ 7,057.00 | \$ 7,269.00 |

| | |
|---|---------------------|
| O & M Budget (3 yr Total) | \$ 21,177.00 |
| Unexpended O & M Budget | \$ 25,122.00 |
| Remaining O & M Budget (Projected) | \$ 3,945.00 |

OPERATION AND MAINTENANCE BUDGET WORKSHEET

FRESHWATER INTRODUCTION S. OF HWY 82/ PROJECT NO. ME-16 / PPL NO. 9 / 2015-2016

| DESCRIPTION | UNIT | EST. QTY. | UNIT PRICE | ESTIMATED TOTAL |
|-------------------------------|------|-----------|------------|-------------------|
| O&M Inspection and Report | EACH | 1 | \$6,851.00 | \$6,851.00 |
| General Structure Maintenance | LUMP | 0 | \$0.00 | \$0.00 |
| Engineering and Design | LUMP | 0 | \$0.00 | \$0.00 |
| Operations Contract | LUMP | 0 | \$0.00 | \$0.00 |
| Construction Oversight | LUMP | 0 | \$0.00 | \$0.00 |

ADMINISTRATION

| | | | | |
|------------------------------------|------|---|--------|---------------|
| STATE Admin. | LUMP | 0 | \$0.00 | \$0.00 |
| FEDERAL SPONSOR 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: | Cap rock dike. | | | | |
| 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 | \$0.00 |
| Navigation Aid | EACH | 0 | \$0.00 | \$0.00 | \$0.00 |
| Signage | EACH | 0 | \$0.00 | \$0.00 | \$0.00 |
| General Excavation / Fill | CU YD | 0 | \$0.00 | \$0.00 | \$0.00 |
| Dredging | CU YD | 0 | \$0.00 | \$0.00 | \$0.00 |
| Sheet Piles (Lin Ft or Sq Yds) | | 0 | \$0.00 | \$0.00 | \$0.00 |
| Timber Piles (each or lump sum) | | 0 | \$0.00 | \$0.00 | \$0.00 |
| Timber Members (each or lump sum) | | 0 | \$0.00 | \$0.00 | \$0.00 |
| Hardware | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| Materials | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| Mob / Demob | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| Contingency (25%) (\$2,211,825 x 0.25) | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| General Structure Maintenance | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| | | 0 | \$0.00 | \$0.00 | \$0.00 |
| | | 0 | \$0.00 | \$0.00 | \$0.00 |
| | | 0 | \$0.00 | \$0.00 | \$0.00 |
| TOTAL CONSTRUCTION COSTS: | | | | | \$0.00 |

TOTAL OPERATIONS AND MAINTENANCE BUDGET:

\$6,851.00



OPERATION AND MAINTENANCE BUDGET WORKSHEET
FRESHWATER INTRODUCTION S. OF HWY 82/ PROJECT NO. ME-16 / PPL NO. 9 / 2016-2017

| DESCRIPTION | UNIT | EST. QTY. | UNIT PRICE | ESTIMATED TOTAL |
|-------------------------------|------|-----------|------------|-----------------|
| O&M Inspection and Report | EACH | 1 | \$7,057.00 | \$7,057.00 |
| General Structure Maintenance | LUMP | 0 | \$0.00 | \$0.00 |
| Engineering and Design | LUMP | 0 | \$0.00 | \$0.00 |
| Operations Contract | LUMP | 0 | \$0.00 | \$0.00 |
| Construction Oversight | LUMP | 0 | \$0.00 | \$0.00 |

ADMINISTRATION

| | | | | |
|------------------------------------|------|---|--------|---------------|
| OCPR / CRD Admin. | LUMP | 0 | \$0.00 | \$0.00 |
| FEDERAL SPONSOR 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 | \$0.00 |
| Navigation Aid | EACH | 0 | \$0.00 | \$0.00 | \$0.00 |
| Signage | EACH | 0 | \$0.00 | \$0.00 | \$0.00 |
| General Excavation / Fill | CU YD | 0 | \$0.00 | \$0.00 | \$0.00 |
| Dredging | CU YD | 0 | \$0.00 | \$0.00 | \$0.00 |
| Sheet Piles (Lin Ft or Sq Yds) | | 0 | \$0.00 | \$0.00 | \$0.00 |
| Timber Piles (each or lump sum) | | 0 | \$0.00 | \$0.00 | \$0.00 |
| Timber Members (each or lump sum) | | 0 | \$0.00 | \$0.00 | \$0.00 |
| Hardware | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| Materials | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| Mob / Demob | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| Contingency (25%) (2,211,825 x 0.25) | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| General Structure Maintenance | LUMP | 0 | \$0.00 | \$0.00 | \$0.00 |
| | | 0 | \$0.00 | \$0.00 | \$0.00 |
| | | 0 | \$0.00 | \$0.00 | \$0.00 |
| | | 0 | \$0.00 | \$0.00 | \$0.00 |
| TOTAL CONSTRUCTION COSTS: | | | | | \$0.00 |

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **\$7,057.00**



OPERATION AND MAINTENANCE BUDGET WORKSHEET

FRESHWATER INTRODUCTION S. OF HWY 82/ PROJECT NO. ME-16 / PPL NO. 9 / 2017-2018

| DESCRIPTION | UNIT | EST. QTY. | UNIT PRICE | ESTIMATED TOTAL |
|-------------------------------|------|-----------|------------|-----------------|
| O&M Inspection and Report | EACH | 1 | \$7,269.00 | \$7,269.00 |
| General Structure Maintenance | LUMP | 0 | \$0.00 | \$0.00 |
| Engineering and Design | LUMP | 0 | \$0.00 | \$0.00 |
| Operations Contract | LUMP | 0 | \$0.00 | \$0.00 |
| Construction Oversight | LUMP | 0 | \$0.00 | \$0.00 |

ADMINISTRATION

| | | | | |
|------------------------------------|------|---|--------|---------------|
| OCPR / CRD Admin. | LUMP | 0 | \$0.00 | \$0.00 |
| FEDERAL SPONSOR 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: | Cap rock dike | | | | |
| | Rip Rap | LIN FT | TON / FT | TONS | UNIT PRICE |
| | | 0 | 0.0 | 0 | \$0.00 |
| | | 0 | 0.0 | 0 | \$0.00 |
| | | 0 | 0.0 | 0 | \$0.00 |
| | Filter Cloth / Geogrid Fabric | SQ YD | 0 | \$0.00 | \$0.00 |
| | Navigation 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 | 0 | \$0.00 | \$0.00 |
| | Materials | LUMP | 0 | \$0.00 | \$0.00 |
| | Mob / Demob | LUMP | 0 | \$0.00 | \$0.00 |
| | Contingency (25%) (2,211,825 x 0.25) | LUMP | 0 | \$0.00 | \$0.00 |
| | General Structure Maintenance | LUMP | 0 | \$0.00 | \$0.00 |
| | | | 0 | \$0.00 | \$0.00 |
| | | | 0 | \$0.00 | \$0.00 |
| | | | 0 | \$0.00 | \$0.00 |
| TOTAL CONSTRUCTION COSTS: | | | | \$0.00 | |

TOTAL OPERATIONS AND MAINTENANCE BUDGET:

\$7,269.00

APPENDIX C

(Field Inspection Notes)

| MAINTENANCE INSPECTION REPORT CHECK SHEET | | | | | |
|---|-----------|-----------------|---|---------|--------------------------|
| Project No. / Name: ME-16 Freshwater Intro. S of Hwy 82 | | | Date of Inspection: October 28, 2014 Time: 11:30 am | | |
| Structure No. Earthen Terraces | | | Inspector(s): Dion Broussard and Mark Mouledous (CPRA), Darryl Clark (USFWS) Darren Richard (LDWF) | | |
| Structure Description: 26,000 LF "duck wing" earthen terraces | | | | | |
| Type of Inspection: Annual | | | Water Level Inside: Outside: Weather Conditions: cloudy and cool | | |
| 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 Timber Walkway | N/A | | | | |
| Timber Wales | N/A | | | | |
| Galv. Pile Caps | N/A | | | | |
| Cables | N/A | | | | |
| Signage /Supports Staff Gages | N/A | | | | |
| Rip Rap (fill) | N/A | | | | |
| Earthen Terraces | Good | | | 11 & 12 | Fully vegetated. |
| 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? | | | | | |



| MAINTENANCE INSPECTION REPORT CHECK SHEET | | | | | |
|---|-----------|-----------------|---|---------|--------------------------|
| Project No. / Name: ME-16 Freshwater Intro. S of Hwy 82 | | | Date of Inspection: October 28, 2014 Time: 12:00 am | | |
| Structure No. Little Constance | | | Inspector(s): Dion Broussard and Mark Mouledous (CPRA), Darryl Clark (USFWS) Darren Richard (LDWF) | | |
| Structure Description: Variable crest concrete control structure Four 4'-8" X 6'-8" flapgates w/ stop logs | | | Water Level Inside: Outside: | | |
| Type of Inspection: Annual | | | Weather Conditions: cloudy and cool | | |
| Item | Condition | Physical Damage | Corrosion | Photo # | Observations and Remarks |
| Concrete Control Structure | Good | | | | |
| Flap Gates | Good | | | | |
| Stop Logs | Good | | | | |
| Hardware | Good | | | | |
| Timber Piles | N/A | | | | |
| Timber Walkway | | | | | |
| Timber Wales | N/A | | | | |
| Galv. Pile Caps | N/A | | | | |
| Cables | Good | | | | |
| Signage /Supports | N/A | | | | |
| Staff Gages | | | | | |
| Rip Rap (fill) | Good | | | 9 & 10 | |
| 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? | | | | | |



| MAINTENANCE INSPECTION REPORT CHECK SHEET | | | | | |
|--|-----------|-----------------|---|---------|--------------------------|
| Project No. / Name: ME-16 Freshwater Intro. S of Hwy 82 | | | Date of Inspection: October 28, 2014 Time: 11:00 am | | |
| Structure No. Hess' Cut | | | Inspector(s): Dion Broussard and Mark Mouledous (CPRA), Darryl Clark (USFWS) Darren Richard (LDWF) | | |
| Structure Description: Variable crest aluminum culverts Four 48" diameter culvs. w/ flapgates and stop logs | | | Water Level Inside: Outside: | | |
| Type of Inspection: Annual | | | Weather Conditions: cloudy and cool | | |
| Item | Condition | Physical Damage | Corrosion | Photo # | Observations and Remarks |
| Flapgates | Good | | | | |
| Steel Grating | Good | | | | |
| Stop Logs | Good | | | | |
| Hardware | Good | | | | |
| Timber Piles Timber Walkway | Good | | | | |
| Timber Wales | Good | | | | |
| Galv. Pile Caps | Good | | | | |
| Culverts | Good | | | | |
| Signage /Supports Staff Gages | N/A | | | | |
| Rip Rap (fill) | Good | | | 7 & 8 | |
| Earthen Embankment | Good | | | 7 & 8 | |
| 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? | | | | | |



| MAINTENANCE INSPECTION REPORT CHECK SHEET | | | | | |
|--|-----------|-----------------|---|---------|---|
| Project No. / Name: ME-16 Freshwater Intro. S of Hwy 82 | | | Date of Inspection: October 21, 2013 Time: 9:30 am | | |
| Structure No. New Cop Cop | | | Inspector(s): Dion Broussard and Mark Mouledous (CPRA), Darryl Clark (USFWS) Darren Richard & Scooter Trosclair (LDWF), Chad Courville (Miami Corporation) | | |
| Structure Description: Variable crest aluminum culverts Four 48" diameter culvs. w/ flapgates and stop logs | | | | | |
| Type of Inspection: Annual | | | Water Level Inside: Outside: Weather Conditions: cloudy and cool | | |
| Item | Condition | Physical Damage | Corrosion | Photo # | Observations and Remarks |
| Flapgates | Good | | | | Contractor needs to provide lifting chains for opening flapgates. |
| Steel Grating | Good | | | | |
| Stop Logs | Good | | | | |
| Hardware | Good | | | | |
| Timber Piles | Good | | | | |
| Timber Walkway | | | | | |
| Timber Wales | Good | | | | |
| Galv. Pile Caps | Good | | | | |
| Culverts | Good | | | | |
| Signage /Supports | N/A | | | | |
| Staff Gages | | | | | |
| Rip Rap (fill) | Good | | | 1 & 2 | |
| Earthen Embankment | Good | | | | |
| 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? | | | | | |



| MAINTENANCE INSPECTION REPORT CHECK SHEET | | | | | |
|---|-----------|-----------------|---|---------|--------------------------|
| Project No. / Name: ME-16 Freshwater Intro. S of Hwy 82 | | | Date of Inspection: October 28, 2014 Time: 10:30 am | | |
| Structure No. McNeese Bayou | | | Inspector(s): Dion Broussard and Mark Mouledous (CPRA), Darryl Clark (USFWS) Darren Richard (LDWF) | | |
| Structure Description: Variable crest aluminum culverts Three 48" diameter culvs. w/ flapgates and stop logs | | | | | |
| Type of Inspection: Annual | | | Water Level Inside: Outside: Weather Conditions: cloudy and cool | | |
| Item | Condition | Physical Damage | Corrosion | Photo # | Observations and Remarks |
| Flapgates | Good | | | | |
| Steel Grating | Good | | | | |
| Stop Logs | Good | | | | |
| Hardware | Good | | | | |
| Timber Piles Timber Walkway | Good | | | | |
| Timber Wales | Good | | | | |
| Galv. Pile Caps | Good | | | | |
| Cables | N/A | | | | |
| Signage /Supports Staff Gages | N/A | | | | |
| Rip Rap (fill) | Good | | | 5 & 6 | |
| Earthen Embankment | Good | | | 5 & 6 | |
| 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? | | | | | |



| Project No. / Name: ME-16 Freshwater Intro. S of Hwy 82 | | | | | Date of Inspection: October 28, 2014 | | Time: 10:00 am | |
|---|-----------|-----------------|-----------|---------|---|--|----------------|--|
| Structure No. Perry Bayou | | | | | Inspector(s): Dion Broussard and Mark Mouledous (CPRA), Darryl Clark (USFWS) Darren Richard (LDWF) | | | |
| Structure Description: Variable crest aluminum culverts Three 48" diameter culvs. w/ flapgates and stop logs | | | | | Water Level Inside: Outside: | | | |
| Type of Inspection: Annual | | | | | Weather Conditions: cloudy and cool | | | |
| Item | Condition | Physical Damage | Corrosion | Photo # | Observations and Remarks | | | |
| Steel Bulkhead / Caps | N/A | | | | | | | |
| Steel Grating | Good | | | | | | | |
| Stop Logs | Good | | | | | | | |
| Hardware | Good | | | | | | | |
| Timber Piles | Good | | | | | | | |
| Timber Wales | Good | | | | | | | |
| Galv. Pile Caps | Good | | | | | | | |
| Cables | N/A | | | | | | | |
| Signage /Supports Staff Gages | N/A | | | | | | | |
| Rip Rap (fill) | Good | | | 3 & 4 | | | | |
| Earthen Embankment | Good | | | 3 & 4 | | | | |
| 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? | | | | | | | | |



Appendix D
(Rockefeller Refuge Operations & Monitoring Report)
Provided by Wildlife and Fisheries Staff



Hwy. 82 Water Control Structure Management Summary

Table 1.

| Water Control Structure | Description |
|-------------------------|----------------------------------|
| Old Cop-Cop Bayou | Four-pipe stop-log flap-gate |
| New Cop-Cop Bayou | Four-pipe stop-log flap-gate |
| Perry Bayou | Three-pipe stop-log flap-gate |
| Bayou McNeese | Three-pipe stop-log flap-gate |
| Hess's Cut | Four-pipe stop-log flap-gate |
| Josephine | Four-pipe stop-log |
| Dyson Bayou | Four-pipe stop-log flap-gate |
| Little Constance | Three 10'X 8' stop-log flap-gate |

Note: See map for structure locations.

Table 2.

| Monitoring Stations |
|---------------------|
| Superior Bridge |
| South of Lake 14 |
| South of Lake 15 |

Note: See map for monitoring station locations

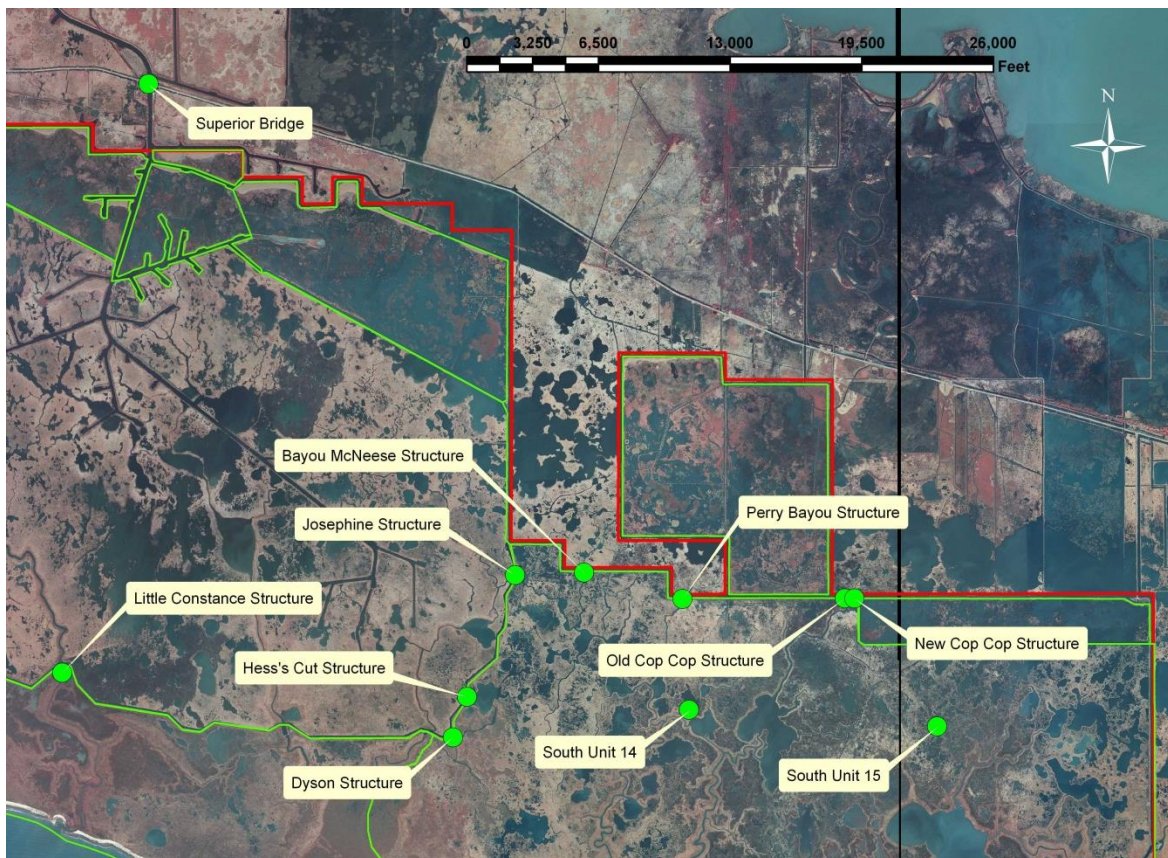


Figure 1. Structure and Monitoring Station Locations.

Table 3.

| Date | Superior Bridge Water Level (Navd 88) | Superior Bridge Water Salinity (PPT) | Structure Name | Hwy 82 Freshwater Introduction Project Water Control Structure Operation and Observations. |
|-------------|--|---|-----------------------|---|
| 10/23/2006 | 1.42 | 5.8 | Old Cop-cop | Removed all stop-logs from structure to remove flood waters. |
| 12/5/2006 | 0.7 | 3.1 | Old Cop-cop | Added stop-logs in all pipes to current water level to retain water in the Mermentau Basin. |
| 1/28/2008 | 0.84 | 1.4 | Old Cop-cop | Three inches of water flowing over stop-logs. |
| 4/7/2008 | 0.82 | 0.8 | Old Cop-cop | Stop-logs were removed from two bays between January and April to increase water flow to Project Area A. |
| 6/2/2008 | 1.26 | 0.1 | Old Cop-cop | Structure is washed out and in need of repairs. Water control is compromised. Repairs scheduled for August 2008. |
| 10/23/2006 | 1.42 | 5.8 | New Cop-Cop | Removed two feet of stop-logs from structure to remove flood waters. |
| 1/8/2007 | 1.42 | 0.8 | New Cop-Cop | Removed all stop-logs from structure to remove flood waters. |
| 1/28/2008 | 0.84 | 1.4 | New Cop-Cop | Stop-logs were replaced and set at 0.5 NAVD Nov./Dec. 2007. |
| 4/7/2008 | 0.82 | 0.8 | New Cop-Cop | Stop logs were placed in structure Feb./March 2008 to retain water in the Mermentau Basin. Logs are 2" to 3" above current water level. |
| 6/2/2008 | 1.26 | 0.1 | New Cop-Cop | Removed three stop-logs from structure to increase water flow into Project Area A. |
| 10/23/2006 | 1.42 | 5.8 | Perry Bayou | Removed two feet of stop-logs from structure to remove flood waters. |
| 1/8/2007 | 1.42 | 0.8 | Perry Bayou | Removed all stop-logs from structure to remove flood waters. |
| 1/28/2008 | 0.84 | 1.4 | Perry Bayou | Stop-logs were replaced and set at 0.5 NAVD Nov./Dec. 2007. |
| 4/7/2008 | 0.82 | 0.8 | Perry Bayou | Stop logs were placed in structure Feb./March 2008 to retain water in the Mermentau Basin. Logs are 2" to 3" above current water level. |
| 6/2/2008 | 1.26 | 0.1 | Perry Bayou | Removed three stop-logs from structure to increase water flow into Project Area A. |
| 10/23/2006 | 1.42 | 5.8 | Bayou McNeese | Removed two feet of stop-logs from structure to remove flood waters. |
| 1/8/2007 | 1.42 | 0.8 | Bayou McNeese | Removed all stop-logs from structure to remove flood waters. |
| 1/28/2008 | 0.84 | 1.4 | Bayou McNeese | Stop-logs were replaced and set at 0.5 NAVD Nov./Dec. 2007. |

| Date | Superior Bridge Water Level (Navd 88) | Superior Bridge Water Salinity (PPT) | Structure Name | Hwy 82 Freshwater Introduction Project Water Control Structure Operation and Observations. |
|-------------|--|---|-----------------------|---|
| 4/7/2008 | 0.82 | 0.8 | Bayou McNeese | Stop logs were placed in structure Feb./March 2008 to retain water in the Mermentau Basin. Logs are 2" to 3" above current water level. |
| 6/2/2008 | 1.26 | 0.1 | Bayou McNeese | Removed three stop-logs from structure to increase water flow into Project Area A. |
| 10/19/2006 | 1.42 | 5.8 | Hess's Cut | Removed of stop-logs from structure to remove flood waters. Twenty inches of water flowing over logs. |
| 1/3/2007 | 1.42 | 0.8 | Hess's Cut | Removed all stop-logs from structure to remove flood waters. |
| 2/21/2007 | 0.9 | 0.9 | Hess's Cut | Stop logs were placed in structure Feb./March 2008 to retain water in the Mermentau Basin. Logs are 2" to 3" above current water level. |
| 9/13/2007 | 1.8 | 0.6 | Hess's Cut | Removed all stop-logs from structure to remove flood waters. |
| 1/28/2008 | 0.84 | 1.4 | Hess's Cut | Stop-logs were replaced and set at 0.5 NAVD Nov./Dec. 2007. Seven inches of water over stop-logs increasing water flow into Area A |
| 6/3/2008 | 1.26 | 0.1 | Hess's Cut | Removed three stop-logs from structure to increase water flow into Project Area A. Approximately 14" to 15" of water over stop-logs increasing water flow into Area A. |
| 10/19/2006 | 1.42 | 5.8 | Little Constance | Removed stop-logs to 3.5' below current water level to remove flood waters. |
| 1/3/2007 | 1.42 | 0.8 | Little Constance | Removed all stop-logs to remove flood water from the Mermentau Basin. |
| 1/28/2008 | 0.84 | 1.4 | Little Constance | Stop-logs are currently 10" below current water level. Stop-logs were replaced between Jan. 2007 and Jan. 2008 |
| 6/3/2008 | 1.26 | 0.1 | Little Constance | Stop-logs were set 13" below current water level in west gate; 10' in center gate; and 5" in east gate. Removing excess water from the Mermentau Basin. |
| 6/5/2008 | 0.96 | 0.7 | Little Constance | All stop-logs were removed from east and center gates. Two logs were removed from west gate. The water column is approximately 3' in the east and center gates and 2' in the west gate. The flap was opened in the center gate to allow ingress and egress of estuarine organisms. The center gate will remain open until water levels or water salinities are compromised. |

| Date | Superior Bridge Water Level (Navd 88) | Superior Bridge Water Salinity (PPT) | Structure Name | Hwy 82 Freshwater Introduction Project Water Control Structure Operation and Observations. |
|------------|---------------------------------------|--------------------------------------|----------------|--|
| 10/19/2006 | 1.42 | 5.8 | Josephine | Removed all but one stop-log to remove flood water from the Mermentau Basin |
| 1/28/2008 | 0.84 | 1.4 | Josephine | No action. Fifteen to 21" of water was running over stop-logs. |
| 4/7/2008 | 0.82 | 0.8 | Josephine | No action. |
| 6/3/2008 | 1.26 | 0.1 | Josephine | No action. |
| 10/23/2006 | 1.42 | 5.8 | Dyson | Removed all but one stop-log to remove flood water from the Mermentau Basin |
| 1/3/2007 | 1.42 | 0.8 | Dyson | Stop-logs were replaced sometime after 10/19/2006. Stop-logs were removed on 1/3/07. Twenty-four inches of water was running over stop-logs. |
| 1/28/2008 | 0.84 | 1.4 | Dyson | None. |
| 4/7/2008 | 0.82 | 0.8 | Dyson | None. |
| 6/3/2008 | 1.26 | 0.1 | Dyson | None. |

| Date | Hwy 82 Freshwater Introduction Project Water Control Structure Operation and Observations. |
|------------|--|
| 01/01/2009 | Stop logs set at 0.80 NAVD for all structures. |
| 05/04/2009 | Removed stop logs in freshwater introduction structures. |
| 06/09/2009 | Put all stop logs back in which is set at 0.80 NAVD |
| 10/05/2009 | Removed all stop logs in freshwater introduction structures |
| 03/18/2010 | Put all stop logs in and set at 0.80 NAVD |
| 01/26/2012 | Opened all freshwater introduction structures |
| 04/30/2012 | Closed all freshwater introduction structures |
| 07/24/2012 | Opened all freshwater introduction structures |
| 10/10/2012 | Put all stop logs in and set at 0.80 NAVD |
| 01/2/2013 | Pulled all stop logs at Hess's Cut, Little Constance, New Cop Cop and Perry Bayou Structures |
| 03/21/2013 | Stop logs set to 0.80 NAVD at Hess's Cut and Little Constance Structures |
| 03/26/2013 | Stop logs set at 0.80 NAVD at New Cop Cop and Perry Bayou Structures |
| 06/18/2013 | Stop logs set at 1.20 NAVD at all structures. |

| Date | Hwy 82 Freshwater Introduction Project Water Control Structure Operation and Observations. |
|-------------|---|
| 07/21/2014 | Pulled all stop logs at Hess's Cut, Little Constance, New Cop Cop and Perry Bayou Structures |
| 08/19/2014 | Put all stop logs in and set at 1.20 NAVD |
| 04/20/2015 | Removed stop logs at all structures |

Note: There were low water levels and higher salinity levels from July 2011 to January 2012.